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# Effect of yoga therapy on Kinesiophobia, pain and function in patients with knee osteoarthritis at the end of 8 weeks: A randomized control trial

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**Abstract**
**Purpose:** The study was conducted to check the therapeutic effect of Yoga therapy on Kinesiophobia, pain and function in the patients with Knee osteoarthritis.
**Intoduction:** Osteoarthritis is a degenerative disease of the joints mainly affecting the knees, hip, intervertebral joints, hands, etc. OA manifest as reduced Range of motion, morning stiffness, painful joint movements, reduced joint space and presence of osteophytes on the radiographic images of the joints while in later stages may develop deformities. Kinesiophobia is defined as the fear of movement generally caused due to any trauma or injury causing avoidance of movements. It causes the avoidance of movements and may increase the chances of disabilities. HATHA yoga is a type of aerobic exercise that includes asanas, pranayama and dhyana.
**Objective:** The study objectives were to evaluate the effect of Yoga therapy on Kinesiophobia, pain and function at the end of 8 weeks in patients with Knee osteoarthritis.
**Method:** 40 subjects within the age group 65-85 were selected on the basis of the inclusion and exclusion criteria. After taking their written consents they were divided into two groups. Group "A" received Yoga therapy + conventional exercises for 4 times a week. Group "B" received conventional exercises for 4 times a week. Pre and Post intervention readings were taken using the outcome measures TAMPA (for Kinesiophobia), VAS (for pain), and WOMAC (for function).
**Result:** The study showed that the experimental group (Group A) had significantly better results than the control group (Group B) with p values 0.0002, 0.0071 and <0.0001 for Kinesiophobia, pain and function respectively.
**Conclusion:** The study concludes that adding Yoga therapy along with conventional treatment has significant effects on reducing Kinesiophobia, pain and thus improving function.

**Keywords:** yoga, kinesiophobia, knee osteoarthritis, pain, function

## 1. Introduction

Osteoarthritis (commonly called as Chronic Degenerative Disease) is a degenerative disease of the joints. It is commonly seen in large weight bearing joints of the body bilaterally. Eg:- Knee joint. OA being the second most common rheumatological problem in India with primary cause being the degeneration of the articular cartilage within the joint [3]. The commonly involved joints are knees, hip, intervertebral joints (spine), joints of hands, etc [1, 2]. Out of all the other types of the osteoarthritis, the prevalence of Knee osteoarthritis is considered to be the highest [1]. Knee osteoarthritis causes varied degrees of functional limitation, disabilities and reduces quality of life. Osteoarthritis is considered to be a major cause of disability in the geriatric population [1]. The prevalence of Knee OA ranges between 22%-39% in India while in the state of Maharashtra it is 10.2% [1, 4]. OA manifest as reduced Range of motion, morning stiffness, painful joint movements, reduced joint space and Presence of osteophytes on the radiographic images of the joints while in later stages may develop deformities.

Kinesiophobia is the term that refers to the "Pathological fear of movement." In the previous studies it is defines as the excessive, irrational and debilitating fear of physical movement due to any previous injuries or traumas [1]. In the context of rehabilitation medicine and physiotherapy it is explained as patient's pain due to movement [1]. Kinesiophobia creates the avoidance of movements or activities in the older population and this avoidance of pain provoking situations will lead to different and increasing disabilities. Kinesiophobia is considered to be factor that hinders rehabilitation and actually prolongs disability and pain. According to cognitive-behavioral models, such as the fear-avoidance model painful experiences will elicit a fear of movement/(re)injury in certain individuals, which often leads to behavioral avoidance and, in the long run, disuse, depression and increased disability.


**Fig 1:** Fear Avoidance Model

"Yoga" is the Sanskrit word which means "union" or "yoking" which simply means that yoga is the union between mind and body, heart and actions [6]. Yoga in the complementary medicine is defined as the mind-body practice as per the ancient Indian philosophy [2]. Yoga is the unity between the thoughts, words and deeds [5]. Yoga is considered to be the union between the peace of mind and the bodily spirit [2]. "Hatha" yoga is a form of yoga that comprises of breathing techniques (pranayamas), physical postures (asanas) and meditation or relaxation techniques (dhyana) [2, 5]. The word "HATHA" is Sanskrit word in which "HA" means "sun" and "THA" means "moon" which is a combination of opposites. As the qualities associated with sun are "heat, masculinity and effort" while the qualities of moon are "coolness, femininity and surrender" [6].

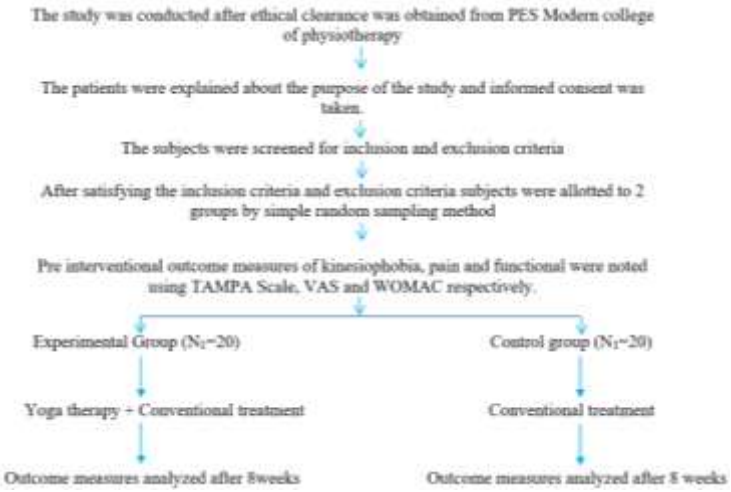
## 2. Materials and Methods

### Materials

- Weight cuff/Dumbbell
- Yoga mat
- Pillow
- Bolster
- Pen and Paper
- Towel roll

### Methodology

- Study Type: Experimental study
- Study Design: Randomized Control Trial (Single Blinded Study)
- Study Population: Male and Females between 65-85 years of age
- Sample Size: 40
- Sampling Method: Simple Random Sampling Method
- Study Setting: Hospitals and Physiotherapy clinics in and around Pune city
- Study Duration: 6 months
- Treatment Duration: 8 weeks




### 2.1 Inclusion and Exclusion Criteria

#### 2.1.1 Inclusion Criteria

- Both male and female genders
- Age group between 65 and 85 years
- Tampa score 37 and above
- VAS score 6 and below
- Berg Balance Scale score between 45 and 56
- Pre diagnosed cases of OA
- Patients with Knee OA for more than 6 months

#### 2.1.2 Exclusion Criteria-

- Cognitive impairments (if MMSE below 23)
- History of knee surgery within last 2 years
- Presence of other musculoskeletal and neurological conditions affecting normal lower limb function
- Patients with cardiac conditions like Myocardial infarction, Coronary artery disease
- Patients with fluctuating Blood pressure
- Patients with peripheral vascular diseases

### 2.2 Outcome Measures

#### 2.2.1 TAMPA Scale-

The TAMPA Scale is used to measure the kinesiophobia. It's a 17-item questionnaire. Scoring is done in 4 components.

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly agree

The score of 37 or above indicates Kinesiophobia.

#### 2.2.2 Visual Analog Scale

VAS is used to measure the intensity of pain. It is represented with a 10cm lie. Initial point being "0" and last point being "10". 0 indicate "No pain" and 10 indicate "Worst possible pain".

#### 2.2.2 WOMAC Scale

The Western Ontario and McMaster Universities

Osteoarthritis Index (WOMAC) is a set of standardized questionnaires. It consists of 5 items for Pain, 2 for Stiffness and 17 for Functional limitation. The difficulties faced by the patient has to be graded on a scale of 5.

1. None (no difficulty)
2. Slight (slight difficult)
3. Moderate (moderately difficult)
4. Very (very difficult)
5. Extremely (extremely difficult)

The score for pain ranges from 0-20. The score for stiffness ranges from 0-8. The score for function ranges from 0-68. The minimum score for WOMAC Scale is "0" and the maximum score is "96"

**Tampa Scale for Kinesiophobia** *(Miller, Kori and Todd 1991)*

*Please circle the answer which most applies to you.*

1 = strongly disagree
2 = disagree
3 = agree
4 = strongly agree

| | | | | |
|---|---|---|---|---|
| 1. I'm afraid that I might injury myself if I exercise | 1 | 2 | 3 | 4 |
| 2. If I were to try to overcome it, my pain would increase | 1 | 2 | 3 | 4 |
| 3. My body is telling me I have something dangerously wrong | 1 | 2 | 3 | 4 |
| 4. My pain would probably be relieved if I were to exercise | 1 | 2 | 3 | 4 |
| 5. People aren't taking my medical condition seriously enough | 1 | 2 | 3 | 4 |
| 6. My accident has put my body at risk for the rest of my life | 1 | 2 | 3 | 4 |
| 7. Pain always means I have injured my body | 1 | 2 | 3 | 4 |
| 8. Just because something aggravates my pain does not mean it is dangerous | 1 | 2 | 3 | 4 |
| 9. I am afraid that I might injure myself accidentally | 1 | 2 | 3 | 4 |
| 10. Simply being careful that I do not make any unnecessary movements is the safest thing I can do to prevent my pain from worsening | 1 | 2 | 3 | 4 |
| 11. I wouldn't have this much pain if there weren't something potentially dangerous going on in my body | 1 | 2 | 3 | 4 |
| 12. Although my condition is painful, I would be better off if I were physically active | 1 | 2 | 3 | 4 |
| 13. Pain lets me know when to stop exercising so that I don't injure myself | 1 | 2 | 3 | 4 |
| 14. It's really not safe for a person with a condition like mine to be physically active | 1 | 2 | 3 | 4 |
| 15. I can't do all the things normal people do because it's too easy for me to get | 1 | 2 | 3 | 4 |
| 16. Even though something is causing me a lot of pain, I don't think it's actually dangerous | 1 | 2 | 3 | 4 |
| 17. No one should have to exercise when he/she is in pain | 1 | 2 | 3 | 4 |

**Fig 2:** TAMPA Scale

Visual Analog Scale (VAS) for pain severity measurement (not to scale)

No pain — Most pain

**Fig 3:** VAS

The Western Ontario and McMaster Universities Osteoarthritis Index
(WOMAC)

Name:_____ Date:_____

Instructions: Please rate the activities in each category according to the following scale of difficulty: 0 = None, 1 = Slight, 2 = Moderate, 3 = Very, 4 = Extremely

Circle **one number** for each activity

| | | |
|---|---|---|
| Pain | 1. Walking | 0 1 2 3 4 |
| | 2. Stair Climbing | 0 1 2 3 4 |
| | 3. Nocturnal | 0 1 2 3 4 |
| | 4. Rest | 0 1 2 3 4 |
| | 5. Weight bearing | 0 1 2 3 4 |
| Stiffness | 1. Morning stiffness | 0 1 2 3 4 |
| | 2. Stiffness occurring later in the day | 0 1 2 3 4 |
| Physical Function | 1. Descending stairs | 0 1 2 3 4 |
| | 2. Ascending stairs | 0 1 2 3 4 |
| | 3. Rising from sitting | 0 1 2 3 4 |
| | 4. Standing | 0 1 2 3 4 |
| | 5. Bending to floor | 0 1 2 3 4 |
| | 6. Walking on flat surface | 0 1 2 3 4 |
| | 7. Getting in / out of car | 0 1 2 3 4 |
| | 8. Going shopping | 0 1 2 3 4 |
| | 9. Putting on socks | 0 1 2 3 4 |
| | 10. Lying in bed | 0 1 2 3 4 |
| | 11. Taking off socks | 0 1 2 3 4 |
| | 12. Rising from bed | 0 1 2 3 4 |
| | 13. Getting in/out of bath | 0 1 2 3 4 |
| | 14. Sitting | 0 1 2 3 4 |
| | 15. Getting on/off toilet | 0 1 2 3 4 |
| | 16. Heavy domestic duties | 0 1 2 3 4 |
| | 17. Light domestic duties | 0 1 2 3 4 |

Total Score: _____ / 96 = _____ %

Comments / Interpretation (to be completed by therapist only):

**Fig 4:** WOMAC Scale

### 2.3 Procedure

Subjects were selected for the study depending on the Inclusion and exclusion criteria. 40 subjects that fulfilled the criteria were selected. Written consent was taken from the subjects. Pre intervention scores of TAMPA Scale, VAS and WOMAC were noted. Subjects were properly explained about the intervention (exercise) and the exercises were done under the supervision of the therapist. Subjects were divided into two groups by simple random sampling method. Each group carried out the intervention for 60-90 minutes 4 times a week.

#### 2.3.1 Group A (Experimental group)-

- **Yoga therapy-**

Hatha yoga was practiced that consists of [2][10]

1. Breathing exercises (Pranayama)
2. Physical postures (Asanas)

These 8 postures were carried out.[2][5][10]

- Utkatasana (chair pose)
- Tadasana (mountain pose)
- Virabhadrasana i (warrior i pose)
- Virabhadrasana ii (warrior ii pose)
- Setu bandha sarvangasana (bridge pose)
- Ardha shalabhasana (half locust pose)
- Upavishta konasana (wide angle seated forward bend pose)
- Padahastasana (standing forward bend pose)

3. Relaxation techniques (Dhyana)

- **Conventional treatment-**[7][8]
- For pain relief- Hot moist pack for 15-20 minutes before the treatment
- Stretching- Hamstrings, quadriceps stretching (3 times with 30 seconds hold for each)
- Statics- Static Hamstrings, Quadriceps, Adductors, Abductors (10 repetitions with 5 seconds hold)
- Active knee ROM (Flexion, Extension)- 10 repetitions
- Strength training- Resisted Knee ROM as per Delorme-Watkin technique

Delorme-Watkin Regimen

- 10 repetitions with 50% of 10 RM
- 10 repetitions with 75% of 10 RM
- 10 repetitions with 100% of 10 RM

(Progression of 10 RM every week)

#### 2.3.2 Group B (Control group)-

- **Conventional treatment-**
- For pain relief- Hot moist pack for 15-20 minutes before the treatment
- Stretching- Hamstrings, quadriceps stretching (3 times with 30 seconds hold for each)
- Statics- Static Hamstings, Quadriceps, Adductors, Abductors (10 repetitions with 5 seconds hold)
- Active knee ROM (Flexion, Extension)- 10 repetitions
- Strength training- Resisted Knee ROM as per Delorme-Watkin technique

Delorme-Watkin Regimen

- 10 repetitions with 50% of 10 RM
- 10 repetitions with 75% of 10 RM
- 10 repetitions with 100% of 10 RM

(Progression of 10 RM every week)

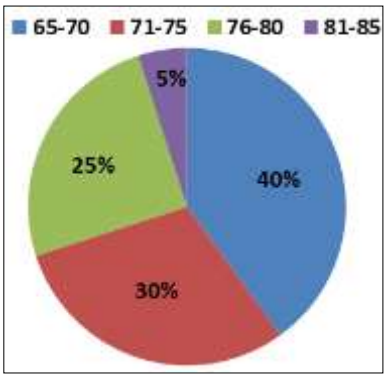
### 2.4 Data and Statistical Analysis

- The pre and post values of TAMPA, VAS and WOMAC were noted. The data was then put in the excel spreadsheet, tabulated and subjected to statistical analysis. The graph pad INSTATS was used for the statistical analysis.
- Pre and post analysis of TAMPA and WOMAC for group A and B was done using "Wilcoxon" test.
- Pre and post analysis of VAS for group A and B was done using "Paired-t test".
- Inter group comparison of Tampa and WOMAC between group A and B was done using "Mann Whitney U test".
- Inter group comparison of VAS between group A and B was done using 'Unpaired-t test".

#### 2.4.1 Age wise distribution

**Table 1:** Age distribution

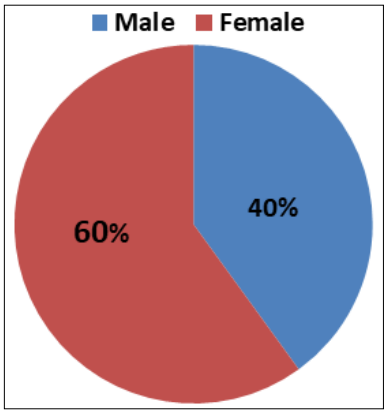
| AGE Group | Total no. |
|---|---|
| 65-70 | 16 |
| 71-75 | 12 |
| 76-80 | 10 |
| 81-85 | 2 |




**Graph 1:** Age distribution

### 2.4.2 Gender wise distribution

**Table 2:** Gender distribution

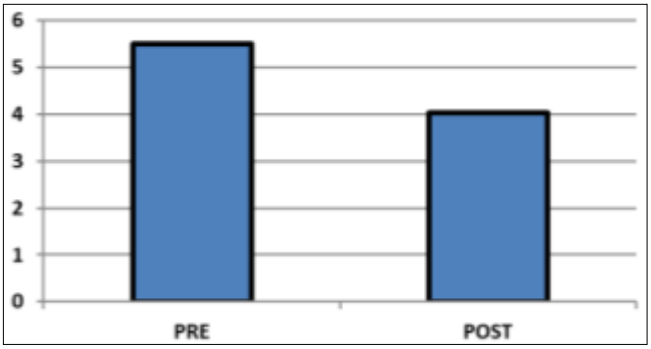



**Graph 2:** Gender distribution

- **Intra Group Visual Analog Scale (Group A)**

**Table 3:** Grp A VAS (pre and post) comparison

| VAS | PRE | POST |
|---|---|---|
| MEAN | 5.5 | 4.035 |
| SD | 0.6399 | 0.5958 |
| P Value | 0.0001 (considered extremely significant) | |
| T Value | 30.011 with 19 degrees of freedom | |

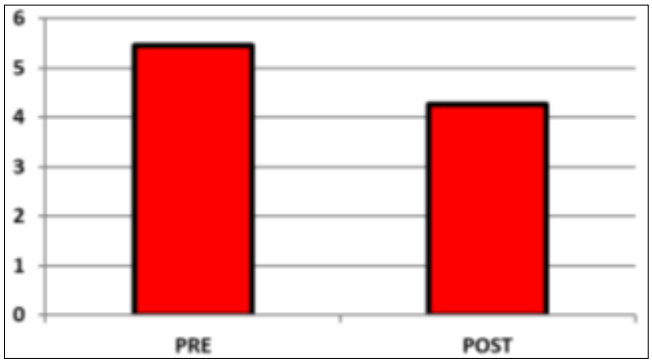



**Graph 3:** Grp A VAS comparison

- **Intra Group Visual Analog Scale (Group B)**

**Table 4:** Grp B VAS (pre and post) comparison

| VAS | PRE | POST |
|---|---|---|
| MEAN | 5.45 | 4.27 |
| SD | 0.8697 | 0.9143 |
| P Value | 0.0001(considered extremely significant) | |
| T Value | 15.904 with 19 degrees of freedom | |

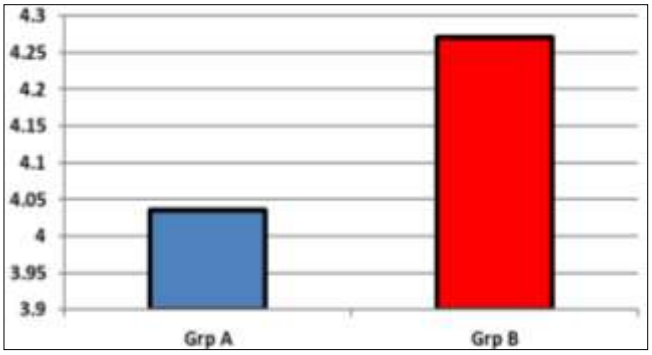



**Graph 4:** Grp B VAS comparison

- **Inter Group Vas Comparison (GRP A and B)**

**Table 5:** VAS comparison (Grp A and B)

| VAS | Group A (POST) | Group B (POST) |
|---|---|---|
| MEAN | 4.035 | 4.27 |
| SD | 0.5958 | 0.9143 |

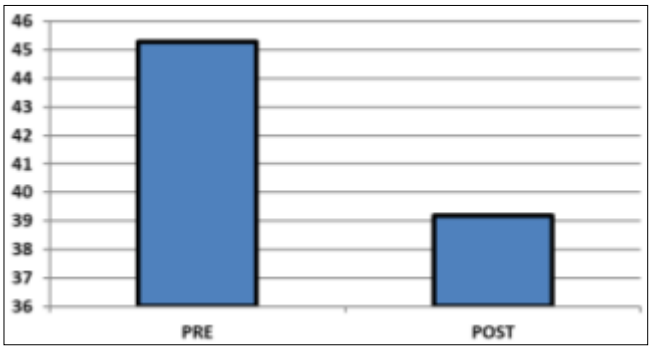



**Graph 5:** VAS comparison (Grp A and B)

- **Intra Group Tampa Scale (Group A)**

**Table 6:** Grp A TAMPA (pre and post) comparison

| Tampa | Pre | Post |
|---|---|---|
| Mean | 45.3 | 39.2 |
| SD | 2.812 | 3.071 |
| P Value | <0.0001(considered extremely significant) | |

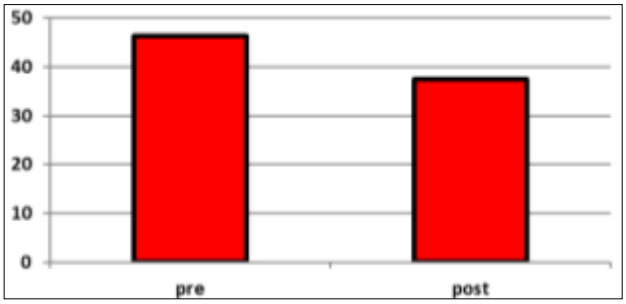



**Graph 6:** Grp A TAMPA comparison

- **Intra Group Tampa Scale (GROUP B)**

**Table 7:** Grp B TAMPA (pre and post) comparison

| Tampa | Pre | Post |
|---|---|---|
| Mean | 46.4 | 37.35 |
| SD | 1.353 | 1.496 |
| P Value | <0.0001(considered extremely significant) | |

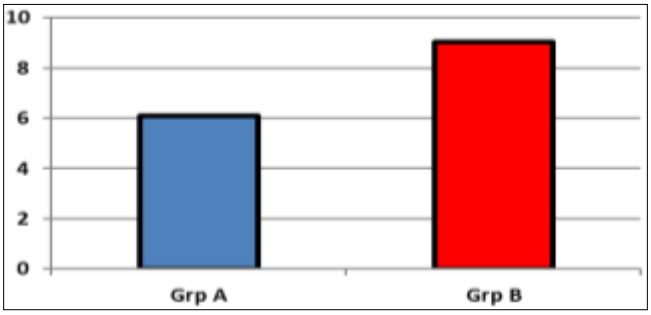



**Graph 7:** Grp B TAMPA comparison

- **Inter Group Tampa Comparison (GRP A and B)**

**Table 8:** TAMPA comparison (Grp A and B)

| Tampa | Group A (Post) | Group B (Post) |
|---|---|---|
| Mean | 6.1 | 9.05 |
| SD | 1.997 | 2.038 |
| P Value | <0.0002 (considered extremely significant) | |

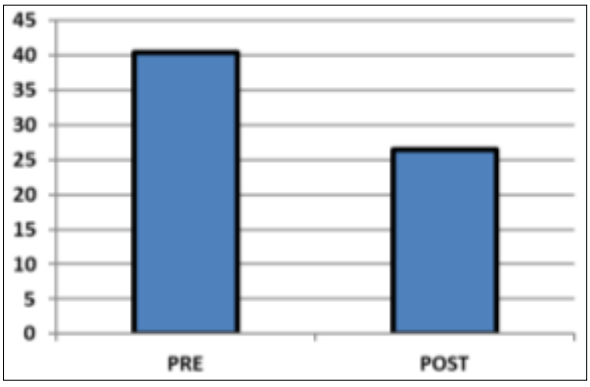



**Graph 8:** TAMPA comparison (Grp A and B)

- **Intra Group Womac Comparison (Grp A)**

**Table 9:** Grp A WOMAC (pre and post) comparison

| Womac | Pre | Post |
|---|---|---|
| Mean | 40.35 | 26.5 |
| SD | 4.069 | 3.017 |
| P Value | <0.0001(considered extremely significant) | |

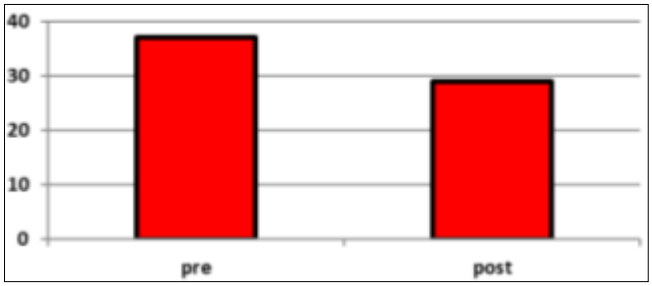



**Graph 9:** Grp A WOMAC comparison

- **Intra Group Womac Comparison (GRP B)**

**Table 10:** Grp B WOMAC (pre and post) comparison

| Womac | Pre | Post |
|---|---|---|
| Mean | 37.1 | 28.85 |
| SD | 5.160 | 4.308 |
| P Value | <0.0001 (considered extremely significant) | |

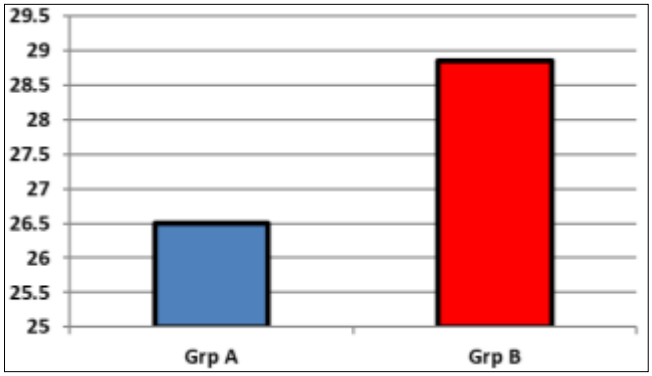



**Graph 10:** Grp B WOMAC comparison

- **Inter Group Womac Comparison (GRP A and B)**

**Table 11:** WOMAC comparison (Grp A and B)

| Womac | Group A (Post) | Group B (Post) |
|---|---|---|
| Mean | 26.5 | 28.85 |
| SD | 3.017 | 4.308 |




**Graph 11:** WOMAC comparison (Grp A and B)

### 2.5 Ethical Issues

Entire process of this research project was done by following the guidelines of Maharashtra University of Health Science. Synopsis proposal including procedure and methodology was approved by the Ethical committee of PES modern college of Physiotherapy at institution level. The safety of the participant was ensured by the researcher and strict confidentiality was maintained regarding patient information, their condition and the treatment.

### 2.6 Informed Consent

The researcher obtained informed written consent from all the participants those were the part of the study. All the participants were explained about the study and the nature of the assessment and treatment. They were given the liberty to quit being part of the study at any time if they wish to without having to give any reason for doing so.

## 3. Results

40 subjects participated in the study. Both males and females within the age group 65-85 were included in the study. Out of total 40 subjects 24 were females (60%) while 16 were male (40%). The values of TANPA Scale, VAS and WOMAC scale were noted before and after the intervention. Graph 3 and 4 shows the comparison between pre and post values of VAS for group A and B respectively. In both the cases the p value is 0.0001 which is significant. Graph 5 shows the comparison between the values of VAS for group A and B. The value for group A and B is 4.035 ± 0.595 and 4.27 ± 0.914. This indicates that there was considerable decrease in the pain in group A than group B. Graph 6 and 7

shows pre and post values of TAMPA Scale for group A and B respectively. Graph 8 shows the comparison between TAMPA values for group A and B. The value for group A is 6.1 ±1.997 while for group B is 9.05 ± 2.038. These mean values indicate that there was considerable decrease in the Kinesiophobia in group A as compared to group B. Similarly graph 9 and 10 shows the comparison between pre and post values of WOMAC for group A and B respectively. Graph 11 shows the comparison between WOMAC values for group A and B. The value for group A and B is 26.5 ± 3.017 and 28.85 ± 4.308 respectively. These values prove there was reduction the difficulty level of the activities in group A than group B. The p values for VAS, TAMPA and WOMAC are 0.0071 (considered significant), 0.0002 (considered extremely significant) and <0.0001 (considered extremely significant) respectively. According to the statistical analysis of the data, the experimental group exercises (Yoga therapy + conventional treatment) was proved to be more effective than the control group exercises (conventional exercises).

## 4. Discussion

Present study was done to study the effectiveness of Yoga therapy on kinesiophobia, pain and function in patients with knee osteoarthritis. Study included the subjects within the age group of 65 to 85 years. Mean age group was 72 years. Both the genders males and females were included in the study. Groups were divided into half by simple random sampling method. Group A received Yoga therapy as well as the conventional treatment. Group B received conventional treatment. The duration of the study was 6 months. The duration of the intervention given was 8 weeks. The treatment was given for 4 times in a week for 60-90 minutes. The pre and post values of Kinesiophobia, pain and function were collected using TAMPA Scale, VAS and WOMAC Scale. According to the study results experimental group exercises is found to be more effective than the control group exercises to reduce pain, kinesiophobia (fear of movement) and improve function. The exercises in the conventional treatment were stretching, statics, strengthening, etc. In Yoga therapy Hatha yoga was practiced which comprised of breathing techniques, 8 yoga postures and relaxation techniques. The statistical reading of the data shows that there was reduction in pain, kinesiophobia and improvement in the function in both the groups (A and B). But there was more effect seen in the group A than in the group B. A study was carried out by Shao-Ln-Zhang and others to check the effect of exercise therapy on knee joint function and synovial fluid cytokinen levels in patients with knee osteoarthritis. The study concluded that the levels of Tumor necrosis factor (TNF-α), C-Reactive protein (hs-CRP) and matrix metalloproteinase-3 (MMP-3) significantly increased in the synovial fluid and which improved the functioning of the knee joint. Another study was carried out by Ida C Helmark and others which proves that exercise causes an increase in both peri-synovial and intraarticular concentrations of Interleukin (IL-10) which has a positive effect of exercise on a chondroprotective anti-inflammatory cytokine response which in turn improves the knee joint functionally. Laidi Kan n others performed a study on the effect of Yoga on pain, function and quality of life in patients with knee osteoarthritis. The study concluded that Yoga helped to reduced pain, improved the function and quality of life. Deepeshwer Singh and others conducted a study to check the effect of Yoga based lifestyle intervention on patients with Knee OA. The study concluded that there is improvement in the muscular strength, flexibility and functional mobility. Corcena Cheung and others carried out a pilot study to check the effect of Yoga on women with knee osteoarthritis. The study proved that yoga therapy is effective in reducing the symptoms knee osteoarthritis. The probable mechanism is that Yoga intervention may increase proteoglycan content, reduce the synovial fluid pressure which in turn prevent cartilage degeneration. This helps for strengthening the periarticular muscles (quadriceps and hamstrings) that normally stabilize the knee joint pain. Yoga practice may prevent synovial fluid volume deterioration by stetching and strengthening different parts of the body, massaging and bringing fresh blood to the internal structures of the joint (joints, muscles and ligaments). Practicing Yoga causes stimulation of the autonomic nervous system which acts by modulating sympathovagal balance to maintain the homeostasis, reducing psychosocial factors such as stress, depression, mood disturbances and enhance self-esteem. Maintaining a proper breathing pattern while performing yogic postures helps to reduce the anxiety and stress.

### 4.1 Limitations

The study was conducted using a small sample size.

### 4.2 Future Scope of Study

The study can be carried out with a larger sample size.
As the percentage of women in the study was more the study can be carried out on the women population.
Effect of more Yoga postures can be checked on Knee OA for kinesiophobia, pain and function.

## 5. Conclusion

This study concludes that adding Yoga therapy along with conventional exercises has significant effects in reducing pain, kinesiophobia (fear of movement) and thus improving function in patients with Knee osteoarthritis.

## 6. Acknowledgement

The authors are thankful to each and every one for their support during the period of the study.

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