

# The Effect of Physiotherapy and Life Style Modification in Treatment of Osteoarthritis of Knee Joint in Elderly in Community

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**Abstract:** ***Background and purpose:** It has been suggested that physiotherapy has been proved to be an effective, non-invasive and cost effective treatment in OA knee. This when combined with life style modifications like dietary changes and weight loss also further helps improving the discomfort due to OA of the knee? This study also investigates the effect of physiotherapy and life style modification mainly use of standing toilet over Indian toilet and to study its effect on quality of life, range of motion of the knee joint and quadriceps strength. **Methods:** Subjects were recruited as per the assessment of OA knee and were distributed into 2 groups. All the subjects were assessed for quality of life on WOMAC scale, knee range with goniometer and quadriceps strength using biofeedback pressure cuff/modified sphygmomanometer. Group 1 was only prescribed exercises that were to be done twice a day for 4 weeks. Group 2 was also prescribed same exercises but in addition to it this group was also advised on use of standing toilet over Indian toilet, avoids using floor kitchen, reducing the use of stair case as much as possible and avoid prolonged cross leg sitting. This was carried out for 4 weeks and the outcome measures assessed again. **Results:** As per the intervention no significant improvements were noted in quality of life or knee range of motion either within the group or between the groups. Though there was a definite improvement in the quadriceps strength but no significant relation was seen. **Conclusions:** Physiotherapy when combine with life style modification mainly the use of standing toilet over Indian toilet has no significance in improving quality of life, knee range of motion and quadriceps strength.*

**Keywords:** Osteoarthritis of the knee, life style modification, physical therapy, goniometer, Sphygmomanometer, WOMAC.

## 1. Introduction

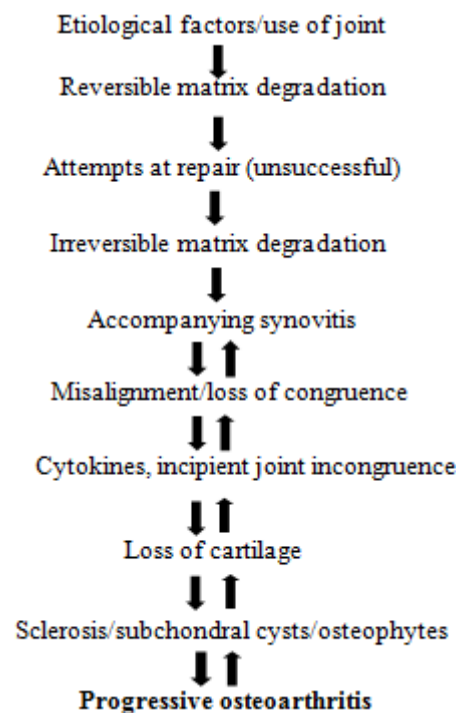
Osteoarthritis (OA) is the most common form of arthritis, typically seen with increasing age affecting all joints. The majority of people over 60 years of age show evidence of osteoarthritis in at least one joint, with radiological evidence presenting in 70% of hips or knees of those older than 65 years. Osteoarthritis (OA) is one of the most prevalent articular disorders affecting humankind and a major cause of disability and socioeconomic burden<sup>1, 2</sup>. OA is a chronic degenerative disorder of multi-factorial aetiology, including acute and/or chronic insults from normal wear and tear, age, obesity, and joint injury<sup>3, 4</sup>.

Epidemiological studies have revealed that there are both endogenous and exogenous risk factors for osteoarthritis (Table 1). Genetic factors unquestionably play a role. In a clinical study involving female twins, Spector et al. showed an effect of heredity on the development of osteoarthritis of the hip and knee. In only very few cases, however, can osteoarthritis be attributed to the effect of a single gene.

**Table 1**

Endogenous and exogenous risk factors for osteoarthritis of the knee	
Endogenous	Exogenous
Age	Macrotrauma
Sex	Repetitive microtrauma
Heredity	Overweight
Ethnic origin (more common in persons of European descent)	Lifestyle factors
Post-menopausal changes	Respective joint surgery

## 2. Pathogenesis



**Features of osteoarthritis:** History: Pain, swelling, stiffness, heat, limp, reduced activity. Examination findings: Heat, pain, swelling, flexion deformity, weakness, restricted movement. Radiographic changes: Osteophytes, subchondral sclerosis, subchondral cysts, joint space narrowing, deformity, soft tissue calcification, effusion. Osteoarthritis has a significant socio-economic cost and therefore essential research is aimed at all levels of intervention and pathogenesis<sup>5, 6, 7</sup>.

Risk factors for knee OA include age, female sex, obesity, trauma, and quadriceps (quads) weakness among these, quadriceps weakness may be the most amenable to treatment for the prevention of knee OA. Numerous studies have documented the symptomatic benefits of isometric and dynamic exercise for individuals with knee OA<sup>8</sup>.

For years now that the field of Physical therapy has developed so much, exercises have become an important part in the treatment of osteoarthritis. Physical activity is an essential recommendation included in all guidelines for management of knee OA<sup>8</sup>. Exercise to ease pain and maintain normal range of motion is needed to improve the function of osteoarthritis patients<sup>9</sup>.

### 3. Need of the Study

Several studies have been done earlier to lay down physical therapy protocol for osteoarthritis if the knee joint. Strengthening, mobilization, stretching etc. have been proved to be really effective in improving the patient's condition with osteoarthritis of the knee. Studies have also been done earlier on life style modification in osteoarthritis of the knee joint life dietary advice and weight loss programs. But no study until now has been done on effect of using modified (standing) toilets on osteoarthritis of knee joint as prolonged squatting is one of the precipitating factors for OA knee and still the rural population which comprises of around 65 percent of India's total population prefer using Indian toilets despite of pain and the discomfort.

So far no life style modification in the form of changes in activities of daily living like floor sitting, squatting during toilet activities etc. has been demonstrated and its effect noted.

### 4. Objectives

- a) To study the effect of Physiotherapy with life style modification in community on:
  - Function (ADL's) and quality of life.
  - Range of Motion.
  - Quadriceps muscle strength.
- b) To compare the above with physiotherapy only.

### 5. Materials and Methodology

- 1) **Ethical Approval:** The study was approved by Sumandeep Vidhapeeth Institutional Ethical Committee (SVIEC) on 14<sup>th</sup> August 2012.
- 2) **Sources of Data:** Villages around Dhiraj General Hospital (Pipariya, Gulabpur, Narmadpura, Amodar, Gugaliyapura).
- 3) **Research Design:** Experimental Study.
- 4) **Sampling:** Convenient sampling: All the subjects with pain in knee joint with diagnosis of OA.
- 5) **Sample Size:** 20 participants were recruited for the study.
- 6) **Inclusion Criteria:**
  - a) Complain of unilateral or bilateral knee joint pain otherwise healthy (self-reported).
  - b) Age 50 years and above.

- c) Participants Willing and able to participate.
- d) Houses having toilets in the house.

#### 7) Exclusion Criteria

- a) Unable to walk.
- b) Any Congenital anomalies of lower limbs.
- c) History of affected lower limb surgery.
- d) Any major injury to knee within the prior 12 months.

#### 8) Outcome Measures:

- a) Knee muscle strength (quadriceps) was measure using modified biofeedback pressure cuff.<sup>10</sup>
- b) Functional assessment and improvement in quality of life was assessed as per WOMAC scale for knee joint<sup>11,12,13</sup>
- c) Range of Motion was measured using a universal goniometer<sup>11</sup>.

#### 9) Treatments<sup>6, 14, 15, 16</sup>

- a) Following this the subjects as per the group allotted underwent the intervention as follows:
- b) Each group was given 6 type of exercise. Initially 4 exercises were carried out for one week. In addition to this 2 more exercises were added at the end of one week. All the 6 exercises were to be carried out for the total of four weeks. The exercises prescribed are as follows:

##### 1<sup>ST</sup> WEEK:

- a) Quadriceps setting exercise – the subjects were made to lie down supine on a hard surface preferably a bed or on the floor. They were then asked to flex the knee that was not to be exercised and asked to raise the affected lower limb keeping it straight at the knee. This exercise was advised to be done twice a day preferably morning and evening, 10 repetitions withhold time of 10 seconds at every repetition
- b) Hip abductor strengthening with strap around the ankle keeping knee extended – for performing this exercise the subjects were made to lie supine with knees extended and B/L hips adducted. Resistance was applied around the ankle joint and the subjects were asked to abduct the hip joints against the applied resistance. For self-practice the subjects were asked to tie a scarf or a piece of cloth around the ankle and do the same exercise. 10 repetitions withhold time of 10 seconds at every repetition.
- c) Self-hamstring stretch in supine lying - subjects were asked to lie down supine over a hard surface keeping the unaffected lower limb extended at the knee. The hip and knee joint of the affected limb were flexed to 90°. The subject was then asked to hold the limb with both the hands just above the knee joint in such a way that the fingers are wrapped around the lower thigh just above the knee joint. Maintaining this position the subjects were then instructed to extend the knee as much as possible and maintain it for 30 seconds. 10 repetitions with 30 second hold time.
- d) Ankle toe movements in standing – this was performed with subject in standing position facing the wall or a pole to which the subject can hold on to. Once patient was comfortable holding the support he/she was asked to rise on toes and go down slowly. 20 repetitions.

The 2 additional exercises prescribed at the end of one week that was to be carried along with the above exercises are:

## 2<sup>ND</sup> to 4<sup>TH</sup> WEEK:

- a) On toes knee bending – subject was asked to stand facing the wall with the support of the wall. Then the subject was asked to stand on the toes and bend his/her knees (flexion of knee) till the subject experienced no pain and was asked to stand up from the point pain started. This was repeated 10 times.
- b) Wall slides – subject was asked to stand against the wall with back supported and feet apart. The subject was then asked to go down bending his knee till the point of pain and then back to starting position. This was repeated 10 times.

All of the above exercises were to be done twice a day, preferably morning and evening. Patient was allowed to rest in between two consecutive sets during these exercises. In any case if the subject was unable to perform any of the above mentioned exercise the number of repetition, hold time and frequency was tailored according to his/her capacity.

## 10) Materials Used for the Study

- Pen.
- Paper.
- Modified commodes.
- Universal goniometer.
- WOMAC scale.
- A printed exercise pictorial pamphlets.
- Biofeedback pressure cuff.
- Regular patient's diary.
- Printed detailed instruction about do's and don'ts (About the educational information).

## 11. Statistical Analysis

Data analysis was done using SPSS 17.0 statistical package. Password protected computer was used for analysis and all

the subjects were coded. Mean and standard deviation of all the variables were calculated. Mean age of both the groups were calculate. Before doing the data analysis, normal distribution of data was checked using Shapiro Wilcoxon test.

Once the data was analyzed for normalcy, for data that was normally distributed, Paired t – test and for the data that was not normally distributed, Wilcoxon Signed Rank test was used to analyze the outcome measures both pre and post intervention within the group.

For analysis between groups for normal data Independent t – test was used and for the data that was not normally distributed, Mann Whitney U test was use to analyze the outcome measures both pre and post intervention.

## 6. Result

As already mentioned out of 55 patients only 32 were falling into the inclusion criteria out of which only 20 patients were included for the study as the rest were not willing to participate in the study. Therefore the result presented here are of 20 patients of whom 19 were females and only 1 was male. Out of these 19 females, 15 had bilateral knee affected, 3 had left knee affected and 1 had right knee affected and the only male had left knee affected. Their mail complain was pain strenuous activities like prolonged squatting as in Indian toilet or while working in the farm, cross leg sitting as in floor sitting during cooking and while ascending and descending staircase. They also complained of morning stiffness and difficulty in walking after prolonged sitting.

## Analysis Within Groups

	Control Group					Experimental Group				
	PRE		POST		P-Value	PRE		POST		P-value
	MEAN	SD	MEAN	SD		MEAN	SD	MEAN	SD	
<b>ROM</b>										
RT FLEX	115	±7.07	118.00	±6.32	0.180	112.00	±12.22	115.00	±8.31	0.059
LT FLEX	112	±10.32	116.00	±6.58	0.032	115.50	±8.75	116.00	±6.99	0.032
RT EXT	-0.800	±2.52	-0.200	±0.632	0.317	-4.80	±12.08	-3.50	±9.44	0.180
LT EXT	-1.00	±3.16	-0.500	±1.58	0.317	-3.00	±9.48	-2.70	±8.53	0.317
<b>STRENGTH</b>										
RT SIDE	21.60	±4.92	28.30	±4.191	0.001	23.00	±14.26	31.70	±11.78	0.001
LT SIDE	18.40	±3.06	27.50	±4.79	0.000	20.60	±8.90	31.20	±12.04	0.001
<b>WOMAC</b>	44.24	±2.465	52.20.	±2.037	0.000	43.66	±3.705	53.75	±2.816	0.000

Pre- post comparisons of within groups are

### 1) ROM

- Control group (paired t-test): ( $p > 0.05$ ) So no significant improvement noted
- Experimental group
  - (Paired t-test for flexion): ( $p > 0.05$ ) so no significant improvement noted
  - (Wilcoxon signed rank test for extension): ( $p > 0.05$ ) so no significant improvement noted

### 2) Strength

- Control group (paired t test): ( $p < 0.05$ ) so significant improvement noted

- Experimental group (paired t test): ( $p < 0.05$ ) so significant improvement noted

### 3) WOMAC

- Control group (paired t test): ( $p < 0.05$ ) so significant improvement noted
- Experimental group (paired t test): ( $p < 0.05$ ) so significant improvement noted

### Analysis between two Groups

	Pre Interventional Value					Post Interventional Value				
	Control Group		Experimental Group		P-Value	Control Group		Experimental Group		P-value
	MEAN	SD	MEAN	SD		MEAN	SD	MEAN	SD	
<b>ROM</b>										
RT FLEX	115.00	±7.07	112.00	±12.22	0.539	118	±6.324	115.5	±8.36	0.459
LT FLEX	112.00	±10.30	115.50	±8.75	0.818	116	±6.582	116	±6.992	1.000
RT EXT	11.10	111	9.90	99	0.466	11.10	111	9.90	99	0.466
LT EXT	10.55	105.5	10.45	104.5	0.942	10.55	105.5	10.45	104.5	0.942
<b>STRENGTH</b>										
RT SIDE	21.60	±4.92	23.00	±14.26	0.773	28.30	±4.19	31.70	±11.78	0.401
LT SIDE	18.40	±3.06	20.60	±8.90	0.470	27.50	±4.79	31.20	±12.04	0.379
<b>WOMAC</b>	44.14	±2.465	43.66	±3.705	0.685	52.20	±2.037	53.75	±2.816	0.176

Pre- post comparisons of between two groups are

#### 4) ROM

- Pre interventional  
(Independent t-test for flexion): ( $p > 0.05$ ) so no significant improvement noted  
(Mann Whitney U test for extension): ( $p > 0.05$ ) so no significant improvement noted
- Post interventional  
(Independent t-test for flexion): ( $p > 0.05$ ) so no significant improvement noted  
(Mann Whitney U test for extension): ( $p > 0.05$ ) so no significant improvement noted

#### 5) STRENGTH

- Pre interventional (Independent t-test) : ( $p > 0.05$ ) so no significant improvement noted
- Post interventional (Independent t-test) : ( $p > 0.05$ ) so no significant improvement noted

#### 6) WOMAC

- Pre interventional (Independent t-test) : ( $p > 0.05$ ) so no significant improvement noted
- Post interventional (Independent t-test) : ( $p > 0.05$ ) so no significant improvement noted

## 7. Discussion

This study is done to investigate whether strengthening exercises of the hip abductors and knee muscles for 4 weeks when combined with life style modification, mainly the change in use of standing toilets in place of Indian toilets in people with knee osteoarthritis improves Range of motion, strength in quadriceps muscles and quality of life of the patients in community.

Strengthening exercises has recently received increased interest as an effective, inexpensive and non – invasive treatment for knee OA due to its ability to reduce knee pain and improve physical function, and also because of its potential ability to reduce knee joint loads. Modification in life style like dietary changes and reducing weight has also proven to be of help in reducing discomfort in OA of the knee. Despite of growth of physical therapy in last few years the elderly in community are still unaware of its effect as a treatment. In rural communities people with knee OA still continue to squat during toilet activities or during farming which is one of the aggravating factors of pain and discomfort in knee OA. In addition to this rural area still

have floor kitchens where people sit for prolonged periods in cross legged position or squatting which further adds to their problems.

The novelty of this study is to focus on helping them to adapt to lifestyle modification which might help them to reduce pain and discomfort of knee OA and to assess whether exercises when combined with life style modification like use of standing toilet over Indian toilets and simple changes like avoiding use of floor kitchens and squatting during farming and to some extent create awareness among the rural people regarding physiotherapy.

Both immobilization and intense physical exercise can contribute to degeneration of the joint and increase the risk of developing the most severe form of OA, which requires arthroplasty, osteotomy or arthroscopy. The two large surveys conducted in India by one group of researchers presented data from these two communities adjusted to the Indian population census of 2001. This adjusted comparison revealed a significantly higher prevalence of knee pain in the rural (13.7%) compared with the urban (6.0%) community. The prevalence of knee pain or symptomatic knee osteoarthritis is high among older people in the Asian region in rural and urban areas. The prevalence is comparable to that found in other regions of the world. OA may lead to severe pain and joint dysfunction leading to discomfort in BADL's.

In my study the quadriceps strength was assessed using Biofeedback pressure cuff which is subjective measurement when dynamometers or isokinetic analysis machines are not available and a greater change could be seen if a proper tool to assess strength may be use.

In this study the patients were advised to start initially with isometric exercises that included 4 exercises for two weeks and at the end of two week 2 more exercises were added to the protocol and total of four week program were prescribed. Studies show that significant change can be seen at 12 weeks of exercises but in this study the program was restricted to 4 weeks yet the results obtained in strength improvement were excellent.

The range of motion was assessed by universal goniometer. The flexion range of majority of the subjects was full but pain full this may be due to their squatting during their ADL's. Some subjects had extension lack with maximum of



30 degree lack. There was not much significant improvement in the extension range.

Previous studies have found that pain in both rheumatoid arthritis (Hakkinen et al 1999, Komatireddy et al 1997) and osteoarthritis (Ettinger et al 1997) is reduced with progressive resistance training, though training intensity was lower in these studies. Fransen et al (2001) found improved pain and physical function in subjects with knee osteoarthritis with a group exercise program. Since the majority of elderly people suffer from some form of arthritis, further study should investigate the best intensity and rate of progression of resistance training for arthritic joints, as well as which specific exercises should be avoided or modified. Similarly in our study there was significant difference in pain among individuals<sup>27</sup>.

Quality of life was assessed as per the WOMAC scale which showed some improvement over all but there was a marked improvement in the criteria of pain during toilet activities in the experimental group when compare to control group. Such types of studies have not been conducted much in community so it's difficult to find suitable literature review. But in present study it showed no difference in overall quality of life by using western toilet but definite improvement in pain which is suggestive of symptomatic relief in experimental group.

The other reason could be already a patient with OA has undergone the degenerative changes within the joint so use of western toilet may have not shown effect. Further studies with prophylactic use of western toilet may show improvement.

As all demographic and dependent variables of interest were similar at baseline, the improvements in quality of life, range of motion was not much significant at the end of 4 weeks but there was definite improvement in strength in all the subjects.

## 8. Conclusion

The final conclusion of the study is that physiotherapy when combined with lifestyle modification, mainly using standing toilet over Indian toilet being the main adaptation does not show any significant change in range of motion, but the quality of life (WOMAC) and quadriceps strength had significantly improved in all the subjects of each group. There was no significant improvement noted in quality of life, range of motion as well as quadriceps strength between the groups.

The study concludes that physiotherapy combined with life style modification mainly the use of modified toilets over Indian toilets has no additional benefit in improving quality of life, range of motion and quadriceps strength.

A study may be required to assess the improvements in quality of life and range by providing these modifications at the very onset of OA.

## 9. Limitations

Limitation of the study was that the number of subjects recruited for the study were very few (20), 10 subjects in each group. The duration of study was also very short to conclude that the life style modifications done with the subject might show any significant improvement. Effectiveness of treatment and data collection methods may have affected the result of the study.

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