

Research Article – Health Science

Effect of multimodal interventions on pain and activities of daily living among the elderly with osteoarthritis

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Abstract

The aim of the present study was to assess the effect of multimodal interventions on pain and activities of daily living among the elderly with knee osteoarthritis attending Physical Medicine and Rehabilitation OPD at General Hospital Alappuzha, Kerala. Objectives were to assess the level of joint pain in elderly with knee osteoarthritis, to assess the ability of elderly to perform activities of daily living, to evaluate the effect of multimodal interventions on pain and activities of daily living of elderly with knee osteoarthritis and to find out association between multimodal interventions and analgesic usage. The investigator adopted quantitative experimental approach for the study and research design was quasi experimental non equivalent control group design. The sample size was 74 elderly patients diagnosed as knee osteoarthritis selected using purposive sampling technique. A structured interview schedule was used to assess the socio personal and clinical data; pain and activities of daily living were assessed by numerical pain rating scale and Katz index respectively. Routine care was given to control group, while the experimental group underwent multimodal interventions which included educational session, isometric exercises and moist heat application for three weeks along with routine care. After three weeks, post-test was done in both groups. The findings revealed that there was a significant reduction in pain ($P < 0.001$), improvement in activities of daily living ($P < 0.001$) and also reduction in frequency of analgesic intake ($p < 0.001$) among elderly with knee osteoarthritis.

Key words: Multimodal interventions, Pain, Activities of daily living, Elderly, Osteoarthritis

Introduction

Ageing is universal, inevitable, social and scientific challenges confronting mankind. It is natural and irreversible process of mankind. The increase in life expectancy, decreased birth rate and death rate has resulted in the increased proportion of the aged people (Hügler *et al.*, 2012). Population ageing, the process by which older individuals become a proportionally larger share of the total population is one of the most distinctive demographic events of the twentieth century. Initially experienced by more developed countries, the process has recently become apparent in much of the developing world as well

for the near future (WHO, 2013). Over the next half century, this trend will intensify. In the more developed regions the number of persons aged 60 or over will increase by about 70 per cent, from 231 million in 2000 to 395 million in 2050. In contrast, in the less developed regions, the older population will more than quadruple during this same period, from 374 million to 1.6 billion. By 2050, nearly four fifths of the world's older population will be living in the less developed regions ((Taljapurkar *et al.*, 2000).

India has around 100 million elderly at present and the number is expected to increase to 323 million, constituting 20 per cent of the total population, by 2050 (Census of India, 2001). Concerning Kerala, it should be noted that in 1961 the elderly population was 5.8 % of total population. In 1971, it was 6.2 % and in 1991, it

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reached 8.8 %. The demographic profile of Kerala, demonstrates that the aged population is on an increase (Census of India, 2001).

Arthritis or rheumatism is the most common cause of locomotion disability in elderly. Worldwide, osteoarthritis (OA) is estimated to be the fourth leading cause of disability. Most of this disability burden is attributable to the involvement of the hips or the knees. OA is strongly associated with ageing and the Asian region is ageing rapidly (Fransen *et al.*, 2011). Osteoarthritis (OA) is the most common form of arthritis affecting nearly 27 million Americans and 151 million individuals world wide⁷. WHO technical report series – 919 ‘The Burden of Musculoskeletal Conditions at the Start of the New Millennium’ estimated that in India, in every 100000 population around 4644 males and 6587 female between the age group of 45 – 59 years and around 20000 males and 19608 females in the age group of 70- 79 are affected with osteoarthritis (Johnell, 1997). OA is a chronic degenerative disorder of multifactor etiology characterized by loss of articular cartilage and peri-articular bone remodelling. OA may cause joint pain, bony or soft tissue swelling, tenderness, bony crepitus, peri-articular muscle atrophy, bony hypertrophy, deformity and marked loss of joint motion. It commonly affects the hands, feet, spine, and large weight-bearing joints, such as the hips and knees (Fransen *et al.*, 2011).

OA of the knee and hip causes more disability in elderly than any other conditions and the risk of disability from knee OA alone is as great as that of cardiovascular disease (Arden and Copper, 2006). Also, beyond its direct effects, knee OA increases the risk of disability resulting from other medical conditions involved with inactivity and obesity (Maheswari, 2002). Osteoarthritis poses a huge societal burden not only because of its high prevalence and large economic impact, but also because of the pain and limitations it causes in both physical and social functioning. 80% of people with osteoarthritis have limitation of movement, and 25% cannot perform their major daily activities of living. Effect of impaired mobility includes falls, physiological consequences, and psychological consequences, social and economic consequences. They are more likely to report worse quality of life than elderly without arthritis (Mili *et al.*, 2003).

Goals of managing osteoarthritis include controlling pain, maintaining and improving range of movement and stability of affected joints and limiting functional impairment. The treatment of osteoarthritis includes non-pharmacological management, pharmacological treatment in the form of drugs which can modify symptoms, symptomatic slow acting drugs for OA or structure modifying OA drugs depending upon the clinical requirement of the patient. Non pharmacologic intervention includes education, behavioural intervention, and weight loss, lower extremity strengthening exercise instructions in use of cane, graded elastic bandages and hot application (Pendleton *et al.*, 2000). Osteoarthritis (OA) is a common chronic joint problem in older adults which causes severe pain and loss of physical function. OA management is aimed at controlling pain, minimizing disability, and improving joint function and health-related quality of life. Owing to severe pain, most patients with OA initially seek conventional pharmacologic therapies, including analgesics, no steroidal anti-inflammatory drugs (NSAIDs), intra-articular corticosteroids, peri-patellar corticosteroids, intra-articular hyaluronic acid, and topical capsaicin. Many of these pain medications have adverse side effects that have the potential to compromise the health status of older adults (Caporali *et al.*, 2005).

Non pharmacologic therapies (NPTs) are widely used in treating older patients with chronic health problems, because NPTs may reduce the risk of polypharmacy and adverse side effects of medications. Therefore, NPTs is not only considered as a complementary or alternative adjunct to medications, but as an indispensable factor in treating older patients with OA (Caporali *et al.*, 2005).

Management of OA is multimodal. Multimodal interventions decreases pain, improves function, reduces stiffness and fatigue and lowers medicines usage (Mahajan *et al.*, 2005). There are very limited data on the effects of multimodal interventions in the management of OA. People with osteoarthritis may experience a number of challenges to their lives as a consequence of their symptoms. Some of these challenges have an effect on the individual's ability to contribute to society or enjoy a reasonable quality of life (Manek and Nancy,

2000). For a developing country like India, this may pose mounting pressures on various socio economic fronts and health care expenditures. Osteoarthritis is also associated with high use of health care resources and costs. There is an emerging need to pay greater attention to ageing-related issues and to promote ageing society (Situation Analysis of the elderly in India, 2011).

Objectives of the study are 1. Assess the level of joint pain in elderly with knee osteoarthritis. 2. Assess the ability of elderly with knee osteoarthritis to perform activities of daily living. 3. Evaluate the effect of multimodal interventions on pain and activities of daily living of elderly with knee osteoarthritis. 4. Evaluate the effect of multimodal interventions on analgesic usage

Materials and methods

Research approach

The research approach adopted for the study was quantitative experimental approach.

Research design

The research design adopted for the present study was quasi experimental non equivalent control group design.

Sample

The sample consisted of 74 elderly patients with knee osteoarthritis who attended physical medicine and rehabilitation OPD of General Hospital, Alappuzha.

Sample size

Sample size in the study was 74.

37 patients each in the control group and experimental group.

Sampling technique

Non probability purposive sampling technique was used to select the samples for the present study.

Criteria for sample selection

Inclusion criteria

Elderly patients:
of age group 60- 75 years
with radiographically and clinically proven knee osteoarthritis

with pain severity ≥ 4 on 10 point numerical pain scale

with Katz index score 3-5

who are willing to participate in the study

who can read and understand Malayalam

Exclusion criteria

Elderly patients:

who are presently on physiotherapy for knee pain

who are planned for lower limb surgery

who are taking corticosteroid injection over the knee joint

who has decreased or no sensation over the joints

who has infection over the legs

whose body mass index $\geq 30 \text{ kg/m}^2$

who are having neurodegenerative disease like Alzheimer's diseases, Parkinson's disease and neuromuscular diseases like multiple sclerosis, GuillainBarre syndrome.

Tool

The research tools used in the present study were:

Tool 1: Structured interview schedule to assess socio personal and clinical data

Section 1: Socio-personal data

Section 2: Clinical data

Tool 2: Numerical pain rating scale to assess knee pain in elderly patients with knee OA.

Tool 3: Katz index to assess independence in daily activities of elderly patients with knee OA

Data collection process

Based on inclusion and exclusion criteria subjects were first allotted to control group. Investigator approached the subjects, explained the study purpose, established rapport and obtained informed written consent. This was followed by the pre testing of control group. Control group was given only routine care (analgesics and instruction regarding straight leg raise exercise) and post testing of control group was done at the end of 3rd week. Instructional module regarding osteoarthritis care was given to control group after post testing.

This was followed by the allocation of subjects to the experimental group based on inclusion and exclusion criteria. Pre testing of experimental group was carried out. There after

multimodal interventions (educational session, local moist heat application using hydrocollator packs and isometric exercises were taught). Along with these multimodal interventions, patients received routine analgesics also.

Details of interventions are as follows

1. *Educational session:* of 1 hour duration on 1st day of intervention on,

Osteoarthritis: causes, risk factors, clinical features and management.

Dietary advices: to achieve and maintain normal body weight. Recommended daily allowances for elderly (according to ICMR recommendations).

Joint protection strategies which included the following

2. *Local moist heat application:* Moist hot packs applied to the knee joint of elderly using hydrocollator packs for 10 minute daily once, for 6 days in a week continued for 3 weeks to reduce pain and to improve joint mobility.

- Hydrocollator packs contain silicate gel in a cotton bag.
- These packs are placed in a hot water tank, which is thermostatically controlled at 71.1-79.4°C.

Treatment time : 10 minutes

Mode of heat transfer : Conduction

Penetration : ¼ - ½ inch

Application of procedure:

Steps

- Wrap the pack with towel.
- Place on treatment area.
- Patients will feel the full effects of the heat at about 7 - 10 minutes; ask them if the temperature is comfortable.

Post-treatment procedures

Check the patient's skin following treatment for any redness if it has occurred.

3. *Isometric exercises:*

Done after the application of moist heat which include quadriceps set, Hamstring stretch, straight leg raise for 30 minutes, daily for 6days in a week and continued for 3 weeks to improve joint mobility and strengthen the muscle.

Post testing of both groups was carried out at the end of 3rd week. Instructional module regarding osteoarthritis care was given to the control group after post testing. For experimental group instructional module was given on the first day after the educational session.

Results

Socio Personal Data

Table 1 reveals that 48.6% of patients in the control group 45.9% of patients in the experimental group belonged to age group of 60-63. 70.3% and 73% of patients were female in the control and experimental group respectively. Control and experimental group were homogenous according to age and gender ($p>0.05$).

Table 2 depicts that, 59.5% of patients in the control group and 35.1% of patients in the experimental group were engaged in occupation demanding physical exertion and 29.7 % and of patients in control and 43.2 % experimental group had no occupation. Majority of patients, 54.1% of patients in the control group and 62.2% in experimental group had monthly income < 3000. Experimental and control group were homogenous according to occupation and monthly income ($p>0.05$).

Table 3 shows that, 73 % of patients in the control and 89.2 % of patients in the experimental group were having Indian type of toilet facility. Both groups were homogenous in terms of type of toilet facility ($p>0.05$).

Distribution of subjects based on clinical data

Table 4 shows that 40.5% in the control group and 62.2 % of patients in the experimental group had no family history of OA. 73 % and 75.7 % of patients had no history of knee injury in the control and experimental group respectively. Both groups were homogenous in terms family history of OA and history of knee injury ($p>0.05$).

Table 5 reveals that, in the control group 35.1 % of patient had both diabetes and hypertension, while it was 59.5% in the experimental group. 75.7% and 78.4 % patients in the control and experimental group respectively had bilateral knee OA. Both groups were homogenous in terms of co morbidities and affected knees ($p>0.05$).

Table 1. Frequency distribution, percentage and chi square value of subjects based on age and gender ($n=74$)

Socio personal data	Control group (n=37)		Experimental group (n=37)		χ^2
	f	%	f	%	
Age					
60-63	18	48.6	17	45.9	2.171
64-67	10	27.1	15	40.6	
68-71	7	18.9	5	13.5	
72-75	2	5.4	0	0.0	
Gender					
Male	11	29.7	10	27.0	0.066
Female	26	70.3	27	73.0	

Table 2. Frequency distribution, percentage and chi square value of subjects based on occupation and monthly income ($n=74$)

Socio personal data	Control group (n=37)		Experimental group (n=37)		χ^2
	f	%	f	%	
Occupation					
None	11	29.7	16	43.2	5.183
Office work mostly sedentary	1	2.7	4	10.8	
Work demanding some walking	0	0	3	8.1	
Work demanding physical exertion	22	59.5	13	35.1	
Work demanding heavy physical exertion	3	8.1	1	2.7	
Monthly income (Rupees)					
< 3000	20	54.1	23	62.2	4.238
3001-5000	9	24.3	12	32.4	
5001-7000	5	13.5	2	5.4	
>7000	3	8.1	0	0	

Table 3. Frequency distribution, percentage and chi square value of subjects based on type of toilet facility ($n=74$)

Type of toilet facility	Control group (n=37)		Experimental group (n=37)		χ^2
	f	%	f	%	
Indian	27	73.0	33	89.2	3.171
European	10	27.0	4	10.8	

Table 4. Frequency distribution, percentage and chi square value of subjects based family history knee OA and history of knee injury ($n=74$)

Clinical data	Control group (n=37)		Experimental group (n=37)		χ^2
	f	%	f	%	
Family history of OA					
Yes	22	59.5	14	37.8	3.462
No	15	40.5	23	62.2	
History of knee injury					
Yes	10	27.0	9	24.3	0.071
No	27	73.0	28	75.7	

Table 6 projects that, 78.4 % of patients in the control and 73% of patients in the experimental group had morning stiffness of knee lasting from 1–15 minutes. Both groups were homogenous in terms of duration of morning stiffness ($p > 0.05$).

Table 7 projects that, 100 % of patients in the control and 100% of patients in the experimental

group had impairment in functions like walking, climbing stairs, raising from seated position and in raising from squatted position.

Table 8 shows that, 81.1 % of patients in the control and 73 % of patients in the control and experimental group had both bony tenderness and crepitation on joint examination.

Table 5. Frequency distribution, percentage and chi square value of subjects based on co-morbidities and affected knee ($n=74$)

Clinical data	Control group (n=37)		Experimental group (n=37)		χ^2
	f	%	f	%	
Co-morbidities					
Hypertension	16	43.2	11	29.7	5.183
Diabetes	4	10.8	1	2.7	
Both diabetes and hypertension	13	35.1	22	59.5	
Diabetes, hypertension and coronary artery disease	1	2.7	3	8.1	
None	3	8.1	0	0	
Affected knee					
Unilateral	9	24.3	8	21.6	0.076
Bilateral	28	75.7	29	78.4	

Table 6. Frequency distribution, percentage and chi square value of subjects based duration of morning stiffness ($n=74$)

Duration of morning stiffness	Control group (n=37)		Experimental group (n=37)		χ^2
	f	%	f	%	
None	0	0.0	1	2.7	0.076
1-15 min	29	78.4	27	73.0	
16-30 min	8	21.6	9	24.3	

Table 7. Frequency distribution and percentage of subjects based on impairment in function ($n=74$)

Impairment in function	Control group (n=37)		Experimental group (n=37)	
	f	%	f	%
Walking	37	100	37	100
Climbing stairs	37	100	37	100
Raising from seated position	37	100	37	100
Raising from squatted position	37	100	37	100

Table 8. Frequency distribution, percentage and chi square value of subjects based on joint examination findings and use of ambulatory aids ($n=74$)

Clinical data	Control group (n=37)		Experimental group (n=37)		χ^2
	f	%	f	%	
Joint examination findings					
Bony tenderness enlargement and crepitation	7	18.9	10	27.0	0.687
Bony tenderness and enlargement	0	0.0	0	0.0	
Bony tenderness and crepitation	30	81.1	27	73.0	
Use of Ambulatory aid					
Yes	3	8.1	2	5.4	0.214
No	34	91.9	35	94.6	

Table 9. Frequency distribution, percentage and chi square value of subjects based on body mass index ($n=74$)

Body mass index	Control group (n=37)		Experimental group (n=37)		df	χ^2
	f	%	f	%		
Normal (18.5-22.9kg/m ²)	2	5.4	5	13.5	2	1.593
Over weight (23.2-26.9kg/m ²)	27	73.0	23	62.2		
Grade-I obesity (27-29.9kg/m ²)	9	24.3	9	24.3		

91.9 % of patients in the control group and 94.6 % of patients in the experimental group were not using any kind of ambulatory aids. Both groups were homogenous in terms of joint examination

findings and use of ambulatory aids ($p>0.05$). Table 9 shows that, 73% of patients in the control group and 62.2 % patients in the experimental group were overweight.

Table 10. Frequency distribution, percentage and chi square value of subjects based on frequency of intake of analgesic on 1st day of treatment (n=74)

Frequency of intake of pain medication on 1 st day	Control group (n=37)		Experimental group (n=37)		χ^2
	f	%	f	%	
Twice daily	32	86.5	32	86.5	0
Once daily	5	13.5	5	13.5	

Table 11. Frequency distribution, percentage and chi square value of subjects based pain, functional abilities and activities of daily living (n=74)

Variables	Control group (n=37)		Experimental group (n=37)		χ^2
	f	%	f	%	
Pain					2.220
Moderate	32	86.5	32	86.5	
Severe	5	13.5	5	13.5	
Activities of daily living					
Full function	9	24.3	15	40.5	
Moderate impairment	28	75.7	22	59.5	

Table 12. Mean, mean difference, standard deviation and Z #value of numeric pain scores between control and experimental group after multimodal interventions

Group	Test	Mean	Mean difference	SD	Z#
Control	Pre	5.70	0.32	1.20	6.107***
	Post	5.38			
Experimental	Pre	5.49	2.50	1.19	
	Post	2.89			

* * * Significant at p< 0.001 level

Table13. Mean, mean difference, standard deviation and Z #value of activities of daily living scores between control and experimental group after multimodal interventions

Group	Test	Mean	Mean difference	SD	Z#
Control	Pre	4.86	0.19	0.40	5.825***
	Post	5.05			
Experimental	Pre	4.62	1.03	0.55	
	Post	5.65			

* * * Significant at p< 0.001 level

Table 14. Frequency distribution, percentage and chi square value of subjects based on frequency of analgesic usage at the 3rd week of treatment (n=74)

Frequency of analgesic usage at 3 rd week	Control group (37)		Experimental group (37)		df	χ^2
	f	%	f	%		
Twice daily	25	67.6	7	18.9	1	17.83
Once daily	12	32.4	30	81.1		

* * * Significant at p< 0.001 level

Only 5.4 % of patients in the control and 13.5 % of patients in the experimental group were having normal body weight. Both groups were homogenous in terms of body mass index (p >0.05).

Table 10 reveals that 86.5 % of patients in both control and experimental group were taking analgesic twice daily and only 13.5 % of patients both in the control and experimental group were

taking analgesic once daily. Both groups were comparable according to frequency of intake of analgesic on 1st day (p>0.05).

Assessment of pain, functional abilities and activities of daily of elderly with knee osteoarthritis

This section deals with the assessment of pain and activities of daily living among elderly with

knee osteoarthritis which was assessed by numeric pain rating scale and Katz index respectively.

Table 11, shows that both group had moderate knee pain (86.5%) and 13.5 % of patients in both group had severe knee pain. 64.9 % of patients in the control and 59.5 % of patients in the experimental group had moderate impairment in functional abilities. 75.7 % and 59.5 % of patients in the control and experimental group respectively had moderate impairment in activities of daily living. Both groups were comparable according to pain and activities of daily living ($p > 0.05$).

Effect of multimodal intervention on pain among elderly with knee osteoarthritis

In order to find out the effect of multimodal interventions on pain among elderly with knee osteoarthritis, the following null hypothesis was formulated. Mann Whitney U test was used to test the effect of multimodal intervention on pain among elderly with knee osteoarthritis.

Table 12, shows that there was statistically significant difference in the pain scores between the control group and the experimental group after the multimodal interventions at $p < 0.001$ level.

Effect of multimodal interventions on activities of daily living among elderly with knee osteoarthritis

In order to find out the effect of multimodal interventions on activities of daily living among elderly with knee osteoarthritis. Mann Whitney U test was used to test the effect of multimodal intervention activities of daily living among elderly with knee osteoarthritis. Table 13, shows that there was statistically significant difference in the activities of daily living score between the control group and the experimental group after the multimodal interventions at $p < 0.001$ level.

Effect of multimodal interventions on selected analgesic usage among elderly with osteoarthritis

Chi square test was used to test the effect of multimodal intervention on analgesic usage among elderly with knee osteoarthritis. Table 14, shows that on 3rd week of treatment, 67.6% of control group were on twice daily medication of analgesic while only 18.9 % patients in the experimental group had to use twice daily medication. After intervention experimental group could

significantly reduce the frequency of analgesic usage than the control group at $p < 0.001$ level.

Results

- 48.6% and 45.9% respectively belonged to age group of 60-63.
- Majority of patients (70.3% and 73%) were female in both control and experimental group.
- In the control group, 37.8% of patients had no formal education while 32.4 % of patients in the experimental group had primary education.
- 59.5% of patients in the control group and 35.1% of patients in the experimental group were engaged in occupation demanding physical exertion and 29.7 % and of patients in control and 43.2 % experimental group had no occupation.
- Majority of patients, 54.1% of patients in the control group and 62.2% in experimental group had monthly income $< \text{Rs } 3000$
- Greater number of patients in both control group and experimental group (73 % and 89.2 % respectively) were having Indian type of toilet facility.
- Among control group 40.5% had no family history of knee OA. 62.2 % of patients in the experimental group had no family history of knee OA.
- Majority, 73 % and 75.7 % of patients had no history of knee injury in the control and experimental group respectively.
- In the control group 35.1 % of patient had both hypertension and diabetes, while it was 59.5% in the experimental group.
- Bilateral knee OA was present in 75.7% patients in the control group and 78.4 % of experimental group.
- 78.4 % of patients in the control and 73% of patients in the experimental group had morning stiffness of knee lasting from 1 – 15 minutes.
- All patients (100%) both in the control and experimental group were having impairment

in all function i.e. in walking, climbing stairs , rising from seated position and rising from squatted position .

- Both bony tenderness and crepitation was present in 81.1 % of patients in the control and 73 % of patients in the experimental group.
- 91.9 % of patients in the control group and 94.6 % of patients in the experimental group were not using any kind of ambulatory aids.
- 73% patients in the control group and 62.2 % of patients in the experimental were belongs to overweight category. Only 5.4 % of patients in the control and 13.5 % of patients in the experimental group were having normal body weight.
- 86.5 % of patients in both control and experimental group were taking analgesic twice daily and only 13.5 % of patients in the control and experimental group were taking analgesic once daily on the first day of treatment.
- 86.5 % of patients in both experimental and control group were having moderate knee pain, 13.5 % of patients in both group had severe knee pain.
- 75.7 % and 59.5 % of patients in the control and experimental group respectively had moderate impairment in activities of daily living.
- There was statistically significant difference in the pain scores between the control group and the experimental group after the multimodal interventions at $p < 0.001$ level.
- There was statistically significant difference in the activities of daily living score between the control group and the experimental group after the multimodal interventions at $p < 0.001$ level.
- 67.6% of control group were on twice daily medication of analgesic while only 18.9 % patients in the experimental group had to use twice daily medication at 3rd weeks of intervention. After intervention it was found that experimental group could significantly

reduce the frequency of intake of analgesic than the control group $p < 0.001$ level.

Discussion

In the present study, majority of patients diagnosed with knee OA were of female gender. In the present study (70.3% of patients in the control and 73% of patients in the experimental group were females). Similar observations were made in other studies. Community oriented programme for the control of rheumatic diseases (COPCORD) study in the Asian region estimated that knee OA increases with age and is higher among women (Tramer *et al.*, 2000; Seto *et al.*, 2008). Present study is supported by another study conducted in Asia indicating that the majority of patients, reporting knee pain and diagnosed as knee OA are females (Felson, 2004).

Present study findings is concomitant with other studies which reported that age over 60 18.95 (11.74-30.59), physically demanding jobs 3.18 (2.11-4.79), obesity 3.46 (2.59-4.62) were strong determinant of knee (Ganvir and Zambare, 2003). Around 47% of patients in the present study were engaged in work demanding physical exertion. Similar observations were found in the ROAD study (Research On Osteoarthritis Against Disability), among Japanese people aged 60 years or above, having an occupation involving climbing more than 1hr a day (Odds ratio (OR) 2.2, 95% confidence interval (CI): 1.6-3.0), standing more than 2hrs a day (OR 2.0, 95% CI: 1.4-2.7) lifting weights of 10kg or more at least once a week were each associated with a 1.4-2.0 increased odds of radiographic knee OA (Muraki *et al.*, 2009).

Present study revealed that 67.5% of elderly patients were overweight 84.3% had grade I obesity which is in accordance with the previous study that found out obesity or over weight, previous knee injuries, family history of OA, were risk factors of OA (Chopra *et al.*, 2001; Ganvir and Zambare, 2003; Yoshimura *et al.*, 2004; Felson, 2004; De Filippis *et al.*, 2004).

Majority (74.3%) had no history of knee injury, 57.3% had no family history of OA which is in accordance to a study was carried out in women in Vikhe Hospital; Ahmednagar, from July 2011 to June. It was identified that there was no history of knee injury in 70 % of subjects and 49

% reported no family history of OA (Ganvir and Zambare, 2003). Present study findings is contradictory to a case-control study conducted in Hong Kong which showed that majority of subjects (91%) had a history of knee injury and had strong family history of OA (Lau *et al.*, 2000). Even though previous knee injury and family history of OA is a predictor of knee OA, this was not observed in the present study. In this study, 81% of patients were using Indian type toilet facility which requires squatting. Similar observations were found in a study conducted in Japan, which demonstrated that squatting is associated with an approximately two-fold significantly increased risk of moderate to severe radiographic knee OA (Lau *et al.*, 2000). From a cohort study conducted among people aged 60 years or older in Beijing (Ganvir and Zambare, 2003), knee squatting was found to be a strong risk factors for knee OA.

Present study finding reported that (86.48%) of elderly experienced moderate and 13.5% experienced severe knee pain. Moderate reduction in functional ability was observed in 67.57% and moderate impairment in activities of daily living in 54.05% of elderly patients with knee OA. This finding is supported by cross-sectional study of patients with symptomatic knee OA carried out in rural clinics of Malaysia where, patients with radiographically proven OA reported moderate to severe pain 59% vs. 36%; moderate reduction in functional ability due to pain 64% and impaired activities of daily living in 39% of patients. It was also reported that patients with knee pain were 2-5 times more likely to report difficulty with walking, stair climbing, mobility and every day housekeeping duties compared to people without knee pain. 61% of patients had functional inability with moderate impairment in activities of daily living (Zakaria *et al.*, 2009).

Educational session was found effective in a clinical trial which was conducted in patients in England with knee OA to evaluate a concise program of self-care education. Result shown that, health education significantly lowered the scores for disability and resting knee pain throughout the year of post intervention follow up ($P < 0.05$) (Hanna *et al.*, 2009). RCT assessing the effectiveness of the dry heat over moist heat showed significant improvement of the total pain

rating scores with heat generating steam group, but no significant change was observed in the dry heat generating group (Seto *et al.*, 2008)

Study was conducted to assess the effects of muscle strengthening exercise on chronic osteoarthritis of the knee. A total of 64 patients of osteoarthritis of the knee joints were studied to observe the effects of isometric quadriceps muscle strengthening exercise. Then improvement was gradually increased day by day and finally there was highly significant improvement ($p = 0.001$) in pain, functional abilities (Topp *et al.*, 2002). There was no single study assessing the effect of multimodal intervention on pain, functional abilities and ADLs. The combination of individual recommendations in this study has resulted in synergistic effect in reducing the pain, improving functional abilities and ADLs of elderly with knee OA. In this study, there was statistically significant difference in the pain scores and activities of daily living score between the control group and the experimental group after the multimodal interventions at $p < 0.001$ level. It was interpreted that multimodal interventions was effective in reducing pain in elderly patients with knee osteoarthritis.

On 3rd week of treatment, 67.6% of control group were on twice daily medication of analgesic while only 18.9 % patients in the experimental group had to use twice daily medication. After the intervention experimental group had significant reduction in the frequency of intake of pain medication than the control group ($p < 0.001$). This is substantiated by the report that patients with moderate to severe pain needs non-steroidal anti-inflammatory drugs (NSAIDs) and should be used at the lowest effective dose as NSAIDs are associated with adverse effects with GI complications such as peptic ulcer, perforations and bleeds and this risk increases with age, concurrent use of other medication and probably with the duration of therapy. Properly applied non pharmacological treatment can limit the need for pharmacological treatment can often offer a better clinical outcome (Tramer *et al.*, 2000).

The complexity of managing OA in older patients is compounded by issues of co-morbidity. In the present study, 95.94% of elderly were having various co-morbidities which might

predispose them to adverse effect of analgesic on long term use. This is in accordance with other studies that incidence of co-morbidity was much higher among older patients with OA (Pendleton *et al.*, 2000; Maheswari, 2002). From this standpoint, the importance of nonpharmacologic therapies (NPTs) should be emphasized in treating older patients with chronic health problems which reduces the risk of polypharmacy and adverse effects of medications. Therefore NPTs should be considered just as complementary or alternative medications, but as an indispensable factor for treating older patients with OA.

Costs associated with OA can be particularly significant for elderly persons, who face potential loss of independence and who, may need help with daily activities. As the population of developed nation's age over the coming decades, the need for better understanding of OA and for improved therapeutic alternatives will continue to grow.

Cost of OA namely direct, indirect and intangible cost. Direct cost includes all resources associated with the treatment. Indirect costs are productivity loss incurred by OA. Intangible cost is the pain and suffering due to disease, which is measured by using the reduction in quality of life. Majority of patients 33.7% had no formal education and the family income of 58.1% of patients were <3000 per month. Even with pain and disability they are engaged in work demanding physical exertion due to low financial status. (Direct, indirect and intangible cost).

Additional money is spend for treatment as 95.4% has co-morbidities like diabetes mellitus, hypertension and coronary artery diseases. 93.24% neglected the usage of ambulatory aid which further put strain on knee. Lack of usage of ambulatory aids was due to lack of knowledge regarding its benefit and additional money to procure it. Elderly need to be empowered by educating the cause, risk factors and treatment modalities with special emphasis to non pharmacologic therapy so that the elderly can lead an independent life and can strive toward healthy ageing.

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