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Knee extensor strengthening versus hip and ankle in anterior knee pain

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ABSTRACT

Anterior knee pain or patellofemoral pain syndrome is concerned of softening of articular cartilage between femur and patella causing erosion of articular cartilage mild to moderate concentric muscle contraction wasting increased "Q" angle postural change, Physiotherapy including hip and ankle strengthening and knee strengthening postural correction can improve symptoms. Purpose: The purpose of the study is to know about which of this groups are more effecting in treating the anterior knee pain effectively group "a" to strengthen hip and ankle postural correction group "b" knee strengthening patellar mobilization. Methods : 30 patients are randomly selected with anterior knee pain .the study include 2 groups group 1 receives knee strengthening patellar gliding warm water fermentation group 2 receives hip and ankle strengthening with postural correction both groups .the outcome includes visual analogue scale, Kujala scale for knee disability and knee outcome survey scale for activities of daily living . Results: There was a significant decrease in pain with hip and ankle strengthening postural correction (hip abductors, external rotator, extensors, ankle supinators, strengthening, stretching of hip adductors, internal rotators, ankle pronators) postural correction than the knee strengthening patellar mobilization (P-0.000<0.05). Hip and ankle strengthening postural correction were decreased in VAS and improving in "Q" angle. Knee extensor and patellar mobilization have not such effective treatment for patella femoral or anterior knee pain. Conclusion: Patella femoral or anterior knee pain relieves with hip and ankle strengthening with postural correction (hip abductors, external rotator, extensors, ankle supinators, strengthening, stretching of hip adductors, internal rotators, ankle pronators) postural correction.

Keywords: *Anterior Knee Pain, Knee Strengthening, Hip, and Ankle Strengthening Postural Correction.*

1. INTRODUCTION

Chondromalacia patella or patella femoral pain syndrome or anterior knee pain refers to a softening of cartilage1 on the posterior aspect of the patella, one of the common lower extremity conditions effecting one of four people (lachman 1984). The patellofemoral arthralgia is affected by sports people most frequently due to over-compression of the patellofemoral articular surface caused by malalignment of the knee, hip, ankle, spine, age factors and metabolic disorders etc.

Patellofemoral pain syndrome (PFPS) have at least two test, painful anterior knee on going up down stairs squatting pseudo locking or stiffness on prolong sitting[2,3] the first description of a lesion related articular cartilage is not caused by osteoarthritis (by Budinger in 1906) but the term chondromalacia used by Aleman and first appeared.

In chondromalacia patella the patella tracks abnormally due to lateral patellofemoral retinaculum tightness[5] Anterior knee pain results from cartilage damage patellofemoral malalignment inflammation due to trauma6 and the cartilage between patella femoral joint works as a natural shock absorber and as this joint depends on both dynamic and static supports for stability[7,8].

It is an over use trauma causing acting pain localized supra patellar anterolateral anteromedial whenever patient tries to do stair climbing getting up from chair squatting kneeling running swimming jumping or leaping9.

It as localized degeneration of articular cartilage of patella characterized by fissuring, fibrillation and erosions may not be effecting knee patellofemoral instability, the patella femoral joint pathology is caused by mechanical factors but also proprioceptor deficits caused by mechanoreceptor injury[9] mechanical problems but also due to proprioceptor deficiency caused by mechanoreceptor damage. In the rehabilitation will be focused on re-educating proprioceptive mechanism by stimulating cognitive reflexes relative to the joint position and movement through activating muscular stabilization of joint in the absence of structural restraints.

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There is an increase in the q-angle due to (VMO) vastus medial oblique's wasting characterized by increase femoral anteversion external tibial torsion and lateral displacement of tibial tubercle increases and lateral pull of patella.

The patellofemoral joint can influence by abnormal femoral transverse and frontal plane movements increased internal rotation and adduction of the hip joint, tibial lateral rotation foot over pronation, ipsilateral pelvic hiking causing hip adductors internal rotators tightness.

There is an increase in the q-angle due to (VMO) vastus medial oblique's wasting characterized by increase femoral anteversion external tibial torsion and lateral displacement of tibial tubercle increases and lateral pull of patella10.Hip and trunk muscle weakness may also increase Retropatellar stress and promote PFPS symptoms. Decreased strength of hip abductors, hip in the literature of 1928 [4.] External rotators, and trunk lateral flexors increases the likelihood of hip adduction and internal rotation during weight bearing. This internal rotation increases Retropatellar stress[13, 14.]

2. MATERIALS AND METHODOLOGY

30 participants with anterior knee pain, who were referred to physiotherapy department of Nizam's college of physiotherapy panjagutta, Hyderabad and willing to take treatment for 8 weeks, were recruited for the study. The subjects were screened and were randomly allocated into two groups-group A (conservative treatment which includes knee muscles strengthening), group B (Hip ankle muscle strengthening with postural correction) using chit method. A written informed consent was taken from each participant.

Ethical clearance was obtained from university's institutional review board. Inclusion criteria were

1) Subjects with peripatellar/retropatellar knee pain for past 2 months in at least two of the activities i.e. prolong sitting, stair ascent or descent, squatting, kneeling

2) Subjects with positive chondromalacia test.

3) Subjects with age group 30-50 Subjects with both genders, and with sedentary life styles. Exclusion criteria were Gender both are included Increased "Q" angle more than 20 degrees Patella femoral arthritis Step test positive.

Control Group

Strengthening will be done by every alternate day adjustable progressive resisted exercise regimen with supine and sitting position with mechanical weight (knee strengthening done

Dosage: 2 sets of each 10 repetitions progressed according to patient capability (this includes VMO strengthening and knee strengthening for extensors and patellar mobilization)

Experimental Group

Hip Strengthening will be done by every alternate day adjustable progressive resisted exercise regimen in side lying first abductor second external rotator group third extensor group (in prone lying) with mechanical weight

Table 1:

sets	repetitions	Amount of resistance
1	10	25%
2	15	50%
3	20	75%
4	30	100% including with functional activities

3. INCLUSIVE CRITERIA

- Age 30-50 years.
- Gender both are included
- Increased "Q" angle more than 20 degree
- Patella femoral arthritis
- Step test positive

Ankle supinator strengthening

Ankle Strengthening will be done by every alternate day adjustable progressive resisted exercise regimen in sitting with inversion of feet with mechanical weight.

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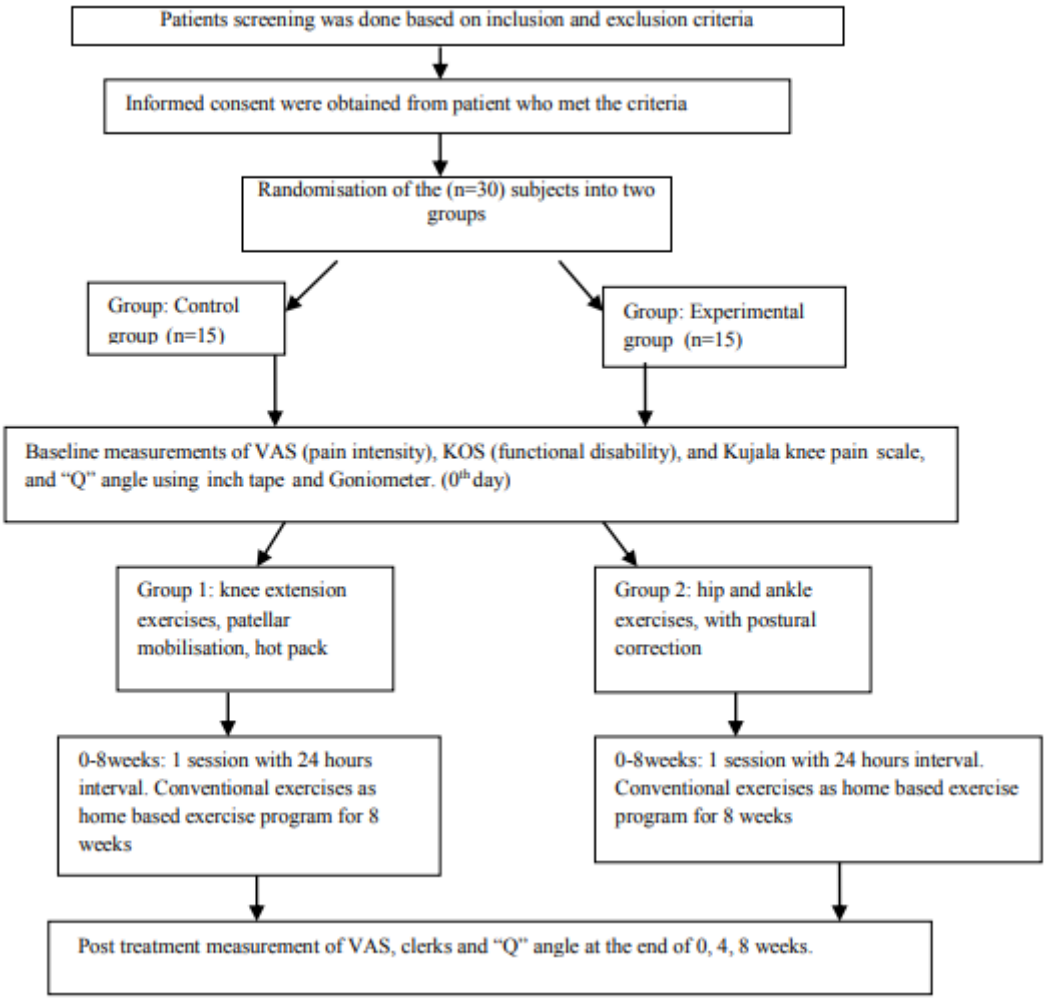
4. EXCLUSIVE CRITERIA

- h/o patellar dislocations
- Any knee surgeries in past 2 years
- Bursitis internal knee derangement syndrome
- Systemic arthritis
- Ligaments injuries and laxity
- Concomitant musculo skeletal or neurological impairments involved with a lower limb that influence
- Pregnancy
- Infection cancer of knee

5. FLOW CHART



Statistical Design and Analysis

Frequency and percentage and percentage distribution of age of the respondents

AGE CATEGORY	Frequency	Percent
30-40 years	12	40.0
40-50 years	18	60.0
Total	30	100.0

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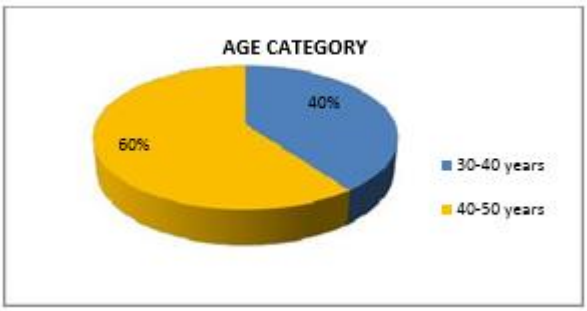
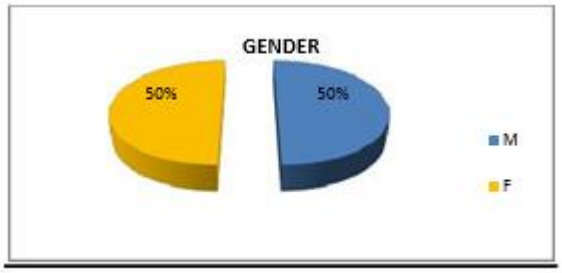
Analysis of frequency and percentage of age category



Frequency Table

GENDER	Frequency	Percent
M	15	50.0
F	15	50.0
Total	30	100.0

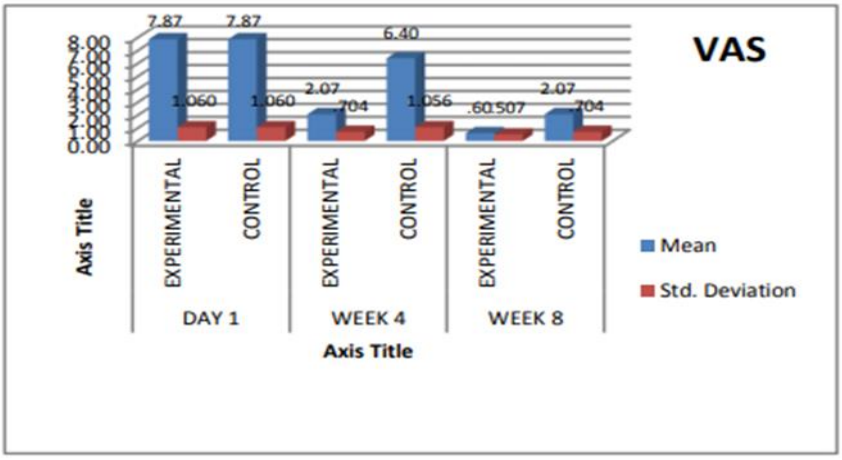
Analysis of frequency and percentage of the gender category



T-test analysis of N value mean and SD of day 1, week 8 in control and experimental of VAS Paired Samples Statistics

GROUP		Mean	N	Std. Deviation	Std. Error Mean
EXP	VAS DAY 1	7.87	15	1.060	.274
	VAS WEEK 8	.60	15	.507	.131
CON	VAS DAY 1	7.87	15	1.060	.274
	VAS WEEK 8	2.07	15	.704	.182

T-test analysis of T value DF and a P value of day 1, week 8 in control and experimental of VAS



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Paired Samples Test

GROUP		Paired Differences	t	df	Sig. (2-tailed)
		Mean			
EXP	VAS DAY 1 - VAS WEEK 8	7.267	27.250	14	.000
CON	VAS DAY 1 - VAS WEEK 8	5.800	17.759	14	.000

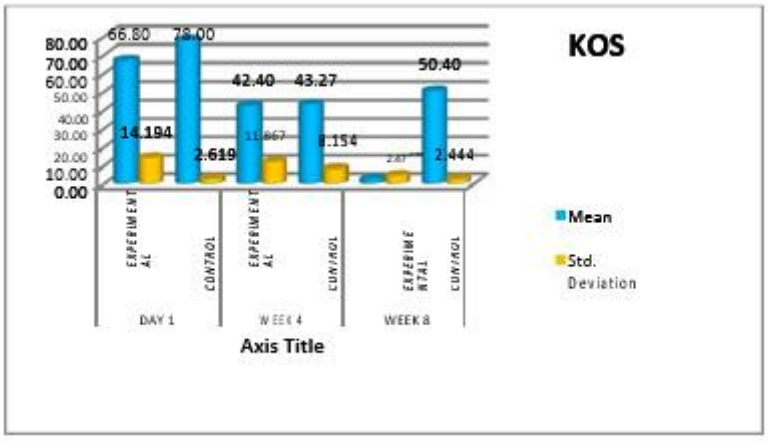
T-test analysis of T value DF and a P value of day 1, week 8 in control and experimental of VAS

T-Test

Paired Samples Statistics

GROUP		Mean	N	Std. Deviation	Std. Error Mean
EXP	KOS DAY 1	66.80	15	14.194	3.665
	KOS WEEK 8	2.47	15	4.596	1.187
CON	KOS DAY 1	78.00	15	2.619	.676
	KOS WEEK 8	50.40	15	2.444	.631

T-test analysis of N value mean and SD of day 1, week 8 in control and experimental of KOS



Paired Samples Test

GROUP		Paired Differences	t	df	Sig. (2-tailed)
		Mean			
EXP	KOS DAY 1 - KOS WEEK 8	64.333	20.614	14	.000
CON	KOS DAY 1 - KOS WEEK 8	27.600	55.679	14	.000

T-test analysis of T value DF and a P value of day 1, week 8 in control and experimental of KOS

T-Test Paired Samples Statistics

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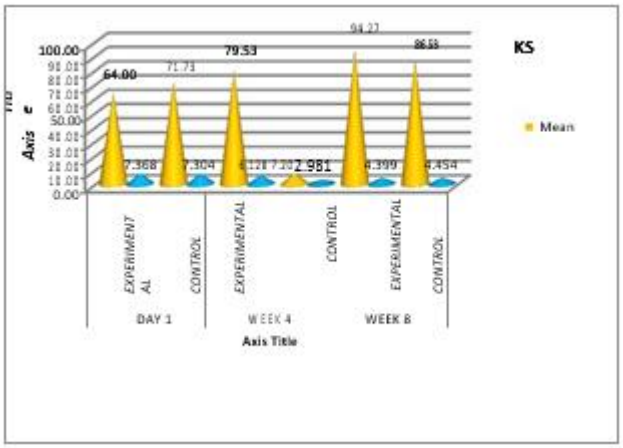
GROUP		Mean	N	Std. Deviation	Std. Error Mean
EXPERIMENTAL	KS DAY 1	64.00	15	7.368	1.902
	KS WEEK 8	94.27	15	4.399	1.136
CONTROL	KS DAY 1	71.73	15	7.304	1.886
	KS WEEK 8	86.53	15	4.454	1.150



Paired Samples Test

GROUP		Paired Differences	t	df	Sig. (2-tailed)
		Mean			
EXPERIMENTAL	KS DAY 1 - KS WEEK 8	-30.267	-20.840	14	.000
CONTROL	KS DAY 1 - KS WEEK 8	-14.800	-9.044	14	.000

T test analysis of T value DF and P value of day 1, week 8 in control and experimental of KOS

T-Test

Paired Samples Statistics

GROUP		Mean	N	Std. Deviation	Std. Error Mean
EXPERIMENTAL	AROM DAY 1 FLEXION	119.33	15	2.582	.667
	AROM WEEK 8 FLEXION	128.67	15	5.164	1.333
CONTROL	AROM DAY 1 FLEXION	112.67	15	8.837	2.282
	AROM WEEK 8 FLEXION	109.07	15	40.004	10.329

T-test analysis of N value mean and SD of day 1, week 8 in control and experimental of AROM flexion

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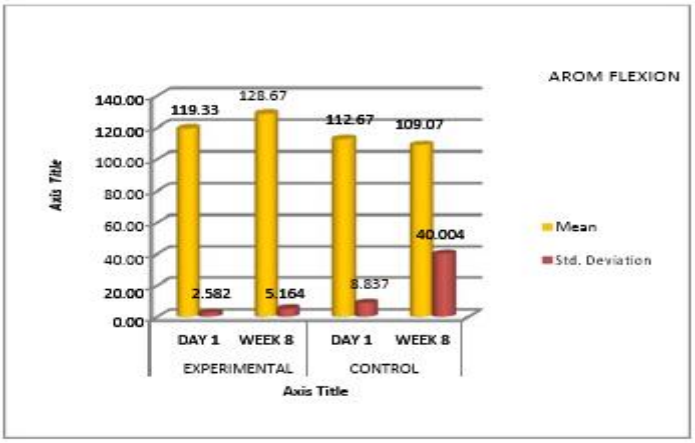


Paired Samples Test

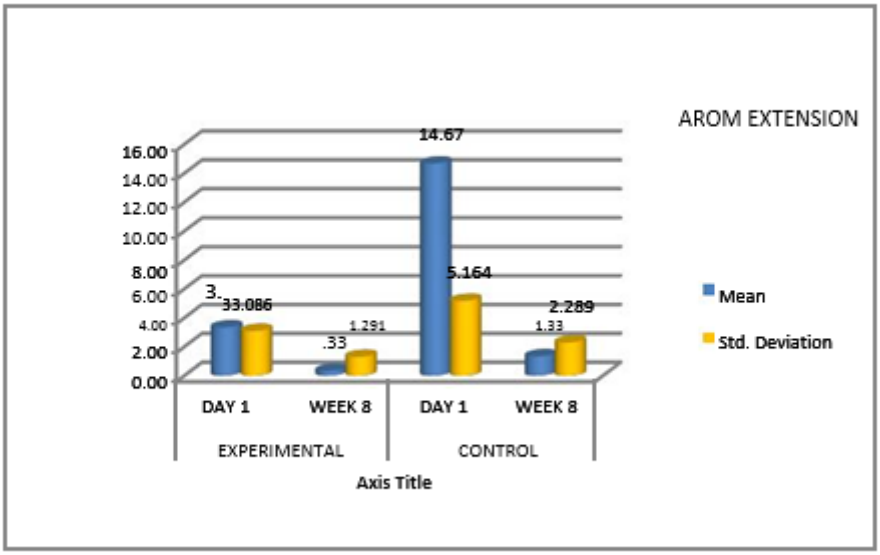
GROUP		Paired Differences	t	df	Sig. (2-tailed)
		Mean			
EXPERIMENTAL	AROM DAY 1 FLEXION - AROM WEEK 8 FLEXION	-9.333	-6.089	14	.000
CONTROL	AROM DAY 1 FLEXION - AROM WEEK 8 FLEXION	3.600	.313	14	.759

T-test analysis of T value DF and P value of day 1, week 8 in control and experimental of AROM flexion

Paired Samples Statistics

GROUP		Paired Differences	t	df	Sig. (2-tailed)
		Mean			
EXPERIMENTAL	AROM DAY 1 EXTENSION - AROM WEEK 8 EXTENSION	3.000	4.583	14	.000
CONTROL	AROM DAY 1 EXTENSION - AROM WEEK 8 EXTENSION	13.333	8.367	14	.000

T-test analysis of N value mean and SD of day 1, week 8 in control and experimental of AROM extension



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6. RESULTS AND DISCUSSION

According to the results obtained from the study title "effectiveness of knee extensor strengthening versus hip ankle strengthening in anterior knee pain," it was concluded that the hip and ankle strengthening with posture correction is more effective than knee strengthening patellar mobilization exercises.

The analysis of outcome measure between groups control group and the experimental group has been presented in table and graph. Comparing mean difference of VAS between group1 is treated with knee extensor strengthening exercises patellar mobilization exercises Group 2 is treated with hip and ankle strengthening postural correction (hip abductors external rotator extensor ankle supinators strengthening, stretching of hip adductors internal rotators ankle pronators postural correction.

In Here we have in the day1 mean is 7.87 SD is 1.060, similarly, week 8 mean is .60 and sd is .507. Here calculated paired t-value is 17.759 DF =14 P-value is .000 <0.05, hence there is a significant decrement in week 6 compared to day1 VAS in control group. Similarly we have in the day1 mean is 7.87 sd is 1.060, similarly, week8 mean is .60 and sd is .507.

Here calculated paired t-value is 27.250 DF=14, p-value .000<.05, hence there is a significant decrement in week 8 compared to day1 VAS in exp group which is highly significant. Comparing mean difference of KOS between group1 is treated with knee extensor strengthening exercises patellar

Paired Samples Test

GROUP		Mean	N	Std. Deviation	Std. Error Mean
EXPERIMENTAL	AROM DAY 1 EXTENSION	3.33	15	3.086	.797
	AROM WEEK 8 EXTENSION	.33	15	1.291	.333
CONTROL	AROM DAY 1 EXTENSION	14.67	15	5.164	1.333

T test analysis of T value DF and a P value of day 1, week 8 in control and experimental of AROM extension

mobilization exercises Group 2 is treated with hip and ankle strengthening postural correction (hip abductors external rotator extensor ankle supinators strengthening, stretching of hip adductors internal rotators ankle pronators postural correction.

In Here we have in the day1 mean is 78.00 sd is 2.619, similarly, week 8 mean is 50.40 and sd is 2.444. Here calculated paired t-value is 55.679 DF =14 P-value is .000 <0.05, hence there is a significant decrement in week 6 compared to day1 KOS in control group. Similarly we have in the day1 mean is 66.80 sd is 14.194, similarly, week8 mean is 2.47 and sd is 4.596. Here calculated paired t-value is 20.614 DF =14 P-value is .000 <0.05, hence there is a significant decrement in week 8 compared to day1 KOS in exp group which is highly significant. Comparing mean difference of KS between group1 is treated with knee extensor strengthening exercises patellar mobilization exercises Group 2 is treated with hip and ankle strengthening postural correction (hip abductors external rotator extensor ankle supinators strengthening, stretching of hip adductors internal rotators ankle pronators postural correction.

Here we have in the day1 mean is 71.73 sd is 7.304, similarly, week 8 mean is 86.53 and sd is 4.454. Here calculated paired t-value is -9.044 DF=14 P-value is .000 <0.05, hence there is a significant decrement in week 6 compared to day1 KS in control group. Similarly we have in the day1 mean is 64.00 sd is 7.368, similarly, week8 mean is 94.27 and sd is 4.399. Here calculated paired t-value is -20.840 df=14 P-value is .000 <0.05, hence there is a significant decrement in week 8 compared to day1 KS in exp group which is highly significant. Comparing mean difference of AROM between group1 is treated with knee extensor strengthening exercises patellar mobilization exercises Group 2 is treated with hip and ankle strengthening postural correction (hip abductors external rotator extensor ankle supinators strengthening, stretching of hip adductors internal rotators ankle pronators postural correction.

AROMS for extension of the knee

Here we have in the day1 mean is 14.67 SD is 5.164, similarly, week 8 mean is 1.33 and SD is 2.289. Here calculated paired t-value is 8.367 DF=14 P-value is .000 <0.05, hence there is a significant decrement in week 6 compared to day1 AROM in control group. Similarly we have in the day1 mean is 3.33 SD is 3.086, similarly, week8 mean is .33 and SD is 1.291. Here calculated paired t-value is -8.367 df=14 P-value is .000 <0.05, hence

7. CONCLUSION

There was a significant decrease in pain with hip and ankle strengthening postural correction (hip abductors, external rotator, extensors, ankle supinators, strengthening, stretching of hip adductors, internal rotators, ankle pronators) postural correction than the knee strengthening patellar mobilization. Hip and ankle strengthening postural correction were decreased in VAS and improving in "Q" angle. Knee extensor and patellar mobilization have not such effective treatment for patella femoral or anterior knee pain.

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Patella femoral or anterior knee pain relievers with hip and ankle strengthening with postural correction (hip abductors, external rotator, extensors, ankle supinators, strengthening, stretching of hip adductors, internal rotators, ankle pronators) postural correction.

8. LIMITATIONS AND SCOPE OF FUTURE STUDIES

Limitation and further directions for study are listed below.

Limitations:

1) Limited sample size

2) Results are applicable to age group 30 years and above only.

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There is a significant decrement in week 8 compared to day1 AROM in an exp group

AROMS for flexion of the knee

Here we have in the day1 mean is 112.67 sd is 8.837, similarly, week 8 mean is 109.07 and sd is 40.004. Here calculated paired t-value is -.313 DF=14 P-value is .759 <0.05, hence there is a significant decrement in week 6 compared to day1 AROM in control group. Similarly we have in the day1 mean is 119.33 sd is 2.582, similarly, week8 mean is 128.67 and sd is 5.164. Here calculated paired t-value is -6.089 DF=14 P-value is .000 <0.05, hence there is a significant decrement in week 8 compared to day1 AROM in exp group which is highly significant.

3) Short duration study (8 weeks).

4) Only outcome measure (VAS, ROM, KOS, KS activities of daily living) were evaluated

5) The study population was limited to those who were able to attend the physiotherapy practice. This excludes anterior knee pain who could not attend treatment due to financial, transport, work or other reasons.

Further Directions

1) Better results can be drawn if the study was conducted with a large sample size for a long duration.

2) Different age groups can be studied separately to draw significant results.

3) Use of different scales for measuring pain

4) Further studies can be emphasized on pathomechanical changes of contralateral limb leading to anterior knee pain

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