International Journal of Health Sciences and Research
www.ijhsr.org ISSN: 2249-9571

Original Research Article

Effect of Anterior Knee Pain on Lower Extremity Functions in Young Adults

Riddhi Shroff[1], Vrushali Panhale[2]

[1]Clinical Physiotherapist, B/19, Modi Nagar, Mathuradas Road, Kandivali (West), Mumbai.
[2]Associate Professor, MGM College of Physiotherapy, Navi-Mumbai.

Corresponding Author: Riddhi Shroff

Received: 05/10/2014 *Revised: 07/11/2014* *Accepted: 11/11/2014*

ABSTRACT

Background - Patellofemoral pain syndrome (PFPS) is the most common diagnosis in outpatients presenting with knee pain. In current Indian scenario, patellofemoral osteoarthritis (PFOA) is on a rise and is early form of knee Osteoarthritis in middle and old age, associated with pain and functional limitation of daily activities. While osteoarthritis research tends to focus on this older age group when they have been functionally limited, our understanding of the etiology of PFOA may benefit the young adults in an Indian scenario as a preventive measure of osteoarthritis in old age.

Methods- After taking informed consent, questionnaire based survey was conducted among sample size of 50 subjects in age group of 18-35 years, Three outcome measures were used, self made demographic questionnaire, anterior knee pain scale and lower extremity functional scale.

Results- It was found in our study that 65% have difficulty in using stairs, 55% in squatting, 47% in sitting with knee flexed and the functions affected in the lower limb are 44% in going up and down the stairs, 30 % in squatting, 16% standing for 1 hour, 10% sitting for 1 hour and there was a high positive correlation between anterior knee pain scale and lower extremity functional scale

Conclusion- Maximally affected activities are difficulty in using stairs, squatting, sitting with knee flexed and maximally affected lower limb functions are going up and down the stairs, squatting and standing for 1 hour, sitting for 1 hour. There is very less awareness of physical therapy as management for anterior knee pain. There was a high positive correlation between anterior knee pain scale and lower extremity functional scale.

Key words- Anterior knee pain, lower extremity, young adults, patellofemoral

INTRODUCTION

Patellofemoral pain syndrome (PFPS) is the most common diagnosis in Indian adults presenting with knee pain. Studies have shown PFPS to be the most common single diagnosis among runners and in sports medicine centers. [1,2] In a previous study PFPS is defined as anterior knee pain involving the patella and retinaculum that excludes other intraarticular and peripatellar pathology. [3]

In current Indian scenario, patellofemoral osteoarthritis (PFOA) is on a rise and is early form of knee Osteoarthritis (OA) in middle and old age, associated with pain and functional limitation of daily activities. [4] While OA research tends to focus on this older age group when they

have been functionally limited , our understanding of the etiology, causes and maximally affected functions in Indian population of patellofemoral osteoarthritis (PFOA) may benefit the young adults in an Indian scenario with varied demographic differences and the level of activity among Indian population which makes them more prone to early risk of PFOA and incorporating importance of physiotherapy among them so that it can prevent osteoarthritis in them. It will also help us have a broader view of events, exposures, morphology, and morbidity related to the patellofemoral joints in a young adult age group in Indian population. [3]

In previous studies until the end of the 1960's anterior knee pain was reported due to chondromalacia patellae, a concept from the beginnings of the 20th century that, from a clinical point of view, is of no value, and ought to be abandoned, given that it has no diagnostic, therapeutic or prognostic implications, In fact, in previous studies many authors have failed to find a connection between anterior knee pain and chondromalacia, [5,6] and in the studies of 1970's anterior knee pain was related to the presence of patellofemoral malalignment (PFM). [7-11]

With the various demographic and habitual variations in Indian population resulting in different amount of stress on joints, the study was chosen to be conducted among Indian population with the validated measures, so that preventive measures can be taken among the group of people with anterior knee pain by increasing awareness among them as precursor to patellofemoral OA in old age, [3] and making them aware about physiotherapy in preventing it.

Thus the aim of the present study was to investigate the effects of anterior knee pain on lower extremity functional activities. The objectives were to find out the activities and functions which were maximally affected due to anterior knee pain in young adults. To find if there was any association between anterior knee pain and lower extremity functional scale and to find physiotherapy awareness for management of anterior knee pain in this age group.

MATERIALS AND METHODS

Subjects

All the 50 participants were recruited from outpatient of orthopaedic and physiotherapy departments, after the ethical approval. An informed consent was obtained from all participants prior to data collection.

Inclusion criteria for participants were: Age group of 18-35 years who indicated pain on anterior surface of knee on pain assessment body chart with the complaint of pain for more than 1 month.

Those participants who were excluded from the study were with radiographic evidence of fracture on lower extremity, unhealed fracture on lower extremity, recent surgery on lower extremity, recent trauma to lower extremity (fracture, soft tissue injury)

Materials

A questionnaire based survey, was carried out by interviewing participant using

1 Demographic data questionnaire

2 Anterior Knee Pain Scale

3 Lower Extremity Functional Scale

Scales

1. Demographic data questionnaire

It is a self made questionnaire, documenting response to 11 questions within which 1st section investigates about demographic details of participants like age, gender, 2nd section about anterior knee pain in which questions included site of pain, duration, 3rd section asked about anterior knee pain affecting functional activities and sports participation and 4th section asked about medical advice and physiotherapy awareness.

2) Anterior knee pain scale

It is a 13 item knee specific self report questionnaire which documents response to six activities. Anterior knee pain scale documents response to Walking, Running, Jumping, Using stairs, Squatting, Sitting for prolonged periods with knees flexed as well as symptoms such as Limp, inability to bear weight through the affected limb, Swelling, abnormal patellar movement, muscle atrophy &limitation of knee flexion, [12] scoring was out of 100, Test reliability of the scale was 95% . [13] Higher the score of scale, lesser is the pain.

3) The Lower Extremity Functional Scale

It is a questionnaire containing 20 questions about a person's ability to perform their daily tasks, The LEFS can be used by clinicians as a measure of patients initial function, ongoing progress and outcome, as well as to set functional goals. [14] Scoring was out of 80. Test reliability was 98%. [13] The lower the score greater the disability.

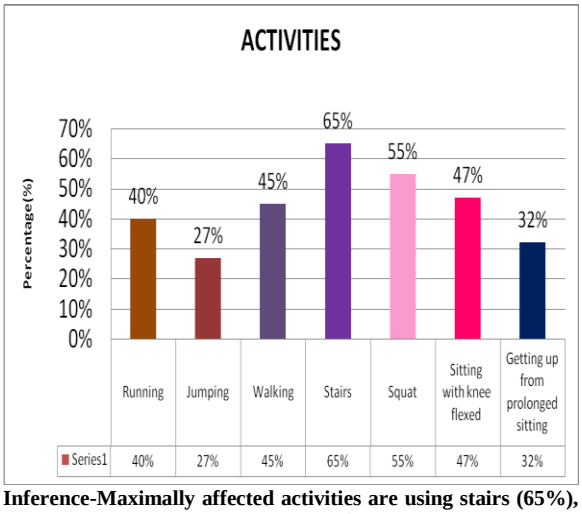
RESULTS

Data analysis and graphical representation was done in MS Excel 2007 and SPSS 16. 50 subjects participated in the study with the mean age group of 27 years (±4.2)

Table 1 shows that 42% males and 58% females were affected due to anterior knee pain and 44% of participants had anterior knee pain from 1 month to 1 year. 28% had from 1-3 years out of which 50% of participants had bilateral lower limb affected due to pain. 30% had right lower extremity affected due to pain and 20% had left lower extremity affected due to pain. Also 30% of participant's reported their daily activities are affected due to pain. Out of 50, 48% participated in sports, 56% of them participated once a week. 37% of the participants participated in football, 32% in cricket and athletics. 44% of participants sporting activity were affected due to pain, it also shows that 37% took medical advice for anterior knee pain and only 35% were aware of physiotherapy for management of anterior knee pain.

Table 1. Participants' details.

Item	Percentage	N
Gender		
Male	42%	21
Female	58%	29
Duration of pain		
1 month to 1 year	44%	22
1 year to 3 years	28%	14
3 to 5 years	12%	6
5 to 7 years	10%	5
> 7 years	6%	3
Site of pain		
Right knee	30%	15
Left knee	20%	10
Bilateral	50%	25
Activities Of Daily Living		
Affected	30%	15
Not Affected	70%	35
Subjects active in sports participation		
Yes	48%	23
No	54%	27
Frequency Of Sports Participation		
Daily	20%	10
> 3 times per week	24%	12
Once a week	56%	28
Affection Of Sports Participation due to pain		
Yes	44%	22
No	56%	28
Medical advice taken for pain		
Yes	37%	19
No	62%	31
Awareness of Physiotherapy for anterior knee pain		
Yes	35%	18
No	64%	32

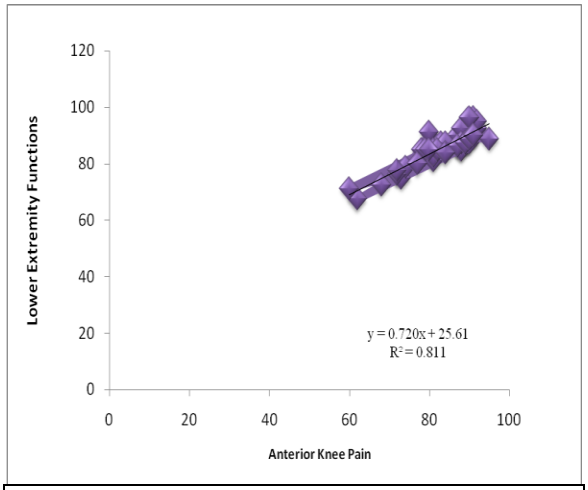


Inference-Maximally affected activities are using stairs (65%), squatting (55%) & sitting with knees flexed (47%)

Figure 1 shows that maximally affected activities were difficulty in using stairs 65%

squatting 55% sitting with knee flexed 47%. The maximally affected lower limb functions were going up and down the stairs 44%, squatting 30 %, standing for 1 hour 16%, and sitting for 1 hour 10%.

Figure 2 shows scatter plot for results of Karl Pearson's correlation that was done between anterior knee pain scale and lower extremity functional scale which showed high positive correlation of 0.85.



Correlation of anterior knee pain and lower extremity functional scale.	
p value	0.000%
r value	0.85%

DISCUSSION

The aim of the present study was to find correlation between anterior knee pain scale and lower extremity functional scale and the study concluded high positive correlation between anterior knee pain and lower extremity functions because in Indian population maximum functional activities requires use of stairs climbing, squatting, standing and sitting for more than 1 hour as all this functional activities have a high association with domains which are majorly affected in anterior knee pain scale so functional activities being are mainly affected because of anterior knee pain.

The patello-femoral joint is formed by the knee cap (patella) sitting on the front of the thigh bone (femur) and as the knee bends, the patella moves in a groove found at the end of the femur as the patella is a floating bone, the patella's position and function depend intimately on the structures that attach to the patella. [15]

Anterior knee pain in young adults occurs under surface of the patella (knee cap) which is pain sensitive, due to damage and irritation to any of the pain sensitive structures between the patella and femur, previous studies have shown that it can be caused by incorrect tracking, or movement of the patella, as the knee bends and straightens, The patella rubs against the femur, instead of gliding correctly in the groove, As patella is a floating bone, therefore, structures that are too tight will pull the patella into the wrong position and it is resulted from the studies that usually the tightness occurs in the lateral thigh structures (tensor fascia lata, gluteals, quadriceps, hamstrings, calf) and a loss of muscular control (and strength) of the inner quadriceps muscle, the vastus medialis oblique (VMO), Previous studies have shown that the outer structures leads to pulling patella laterally, eventually too much incorrect rubbing leads to inflammation, pain, swelling and dysfunction (ie difficulty walking down stairs and hills). [15]

Various patterns of weaknesses have been reported in previous studies as cause of anterior knee pain, with selective weakness in eccentric muscle strength, within the quadriceps muscle and in terminal knee extension. The significance of muscle function in a closed versus open kinetic chain has been discussed, but is far from well investigated. [16]

Another probable cause is painful overuse injury of the patella tendon, which connects the kneecap (patella) to the shin (tibia), this occurs as a result of degeneration (either acute or chronic) and a 'weakening' within the patella tendon itself, without the

presence of inflammation, It is caused by excessive loads on the patella tendon, particularly if there are insufficient rest periods, It is most commonly seen in people who are highly engaged in sports participation. [15]

In one of the previous study done by Vicente Sanchis-Alfonso explaining all probable causes of anterior knee pain reports that from a biomechanical point of view, there are two factors that can contribute to pain: (1) Patella-femoral malallignment(PFM) and (2) joint loading, that depends on intensity and duration of activity. Thus, the presence of PFM would reduce the person`s envelope of loading potential, [17] Presumably, this is because PFM, reduces patellofemoral contact area which in turn would results in elevated stress across the joint. [5]

In previous studies it has been stated that in patients with PFM there is an adaptative shortening of the lateral retinaculum as a consequence of the lateral displacement of the patella. With knee flexion, the patella migrates medially into the femoral trochlea, [18] which produces a recurrent stretching on the shortened lateral retinaculum that may cause nerve changes such as neuromas and neural myxoid degeneration. [1,2,12]

Moreover, there are studies that performed histological studies of the medial retinaculum and they hypothesize that short and repetitive episodes of tissue ischemia, maybe to a mechanism of vascular torsion or vascular bending, which could be induced by a medial traction over a retracted lateral retinaculum, could trigger release of nerve growth factor (NGF) and vascular endothelial growth factor (VEGF) on PFM. Once NGF is present in the tissues, it induces hyperinnervation, attraction of mastocytes, and substance P release by free nerve endings, [10] In addition; VEGF induces hypervascularization and plays also a role increasing neural proliferation. It bands affect patella lateral structures, [17] can also be a probable cause of anterior knee pain.

Also other objective was to find maximally affected activities and results have shown stairs, squatting, prolonged sitting with knee flexed and walking as maximally affected, this positions that are adopted in sports or even in activities of daily life of Indian population, such as maintained knee flexion and knee valgus, will contribute to increasing the overload of the subchondral bone due to the increment of the patellofemoral joint reaction and Q angle, [5] Our study concludes that ascending and descending stairs is one of the most painful activities in participants with anterior knee pain.

Moreover, walking down stairs is more challenging than step ascent due to the level of eccentric control required during step descent and as reported in previous study, the PFJR is dependent on the magnitude of the quadriceps force and knee flexion angle, the compressive force acting between the patella and femoral trochlea during stair descent would be expected to be significant, On the contrary, in the young patient with PFPS there is a statistically significant reduction in the knee extensor moment during walking down stairs compared to healthy control subjects, This reduction of the knee extensor moment could be a compensatory strategy used by patients with PFPS to minimize pain aggravation during activities such as walking down stairs. The reduction of the knee extensor moment, with the subsequent smaller quadriceps contraction, will provoke a decrease of the PFJR and a decrease of the loading of patellofemoral joint during pain-provoking activities such as walking down stairs. Moreover, the decrease of the active shock absorption through quadriceps muscle contraction supposes greater shock

absorption through the bone and cartilage that could explain tibiofemoral pain and predispose to osteoarthritis of the knee. [17]

As reported in previous study, another factor that could contribute to the knee extensor moment reduction could be the decrease of the stance time duration, another strategy for reducing knee extensor moment in subjects with PFPS could be the decrease of knee flexion angles during the stance phase of stair ambulation compared to control healthy subjects, with a lesser knee flexion, the lever arm of the ground reaction force is shortened and consequently the knee extensor moment is reduced, equilibrium being achieve by fewer quadriceps contractions resulting in anterior knee pain, a decrease of the vertical ground reaction force was also observed compared to the healthy extremity. This could reflect an apprehension to load the knee joint at the beginning of the stance phase and could contribute to the knee extensor moment reduction, PFPS patients use strategies to diminish patellofemoral joint loading during walking down stairs when compared to a pain free control group, therefore, in previous study it is concluded that anterior knee pain cannot be attributed to excessive lower limb loading during walking down stairs. [17]

CONCLUSION

Maximally affected activities are difficulty in using stairs, squatting, sitting with knee flexed and maximally affected lower limb functions are going up and down the stairs, squatting and standing for 1 hour, sitting for 1 hour. There is very less awareness of physical therapy as management for anterior knee pain, so our role in making them aware about stretching of tight muscles, strengthening of weak muscles & also recreational activities like cycling should be advised and more awareness needs to be created in society and community set ups, in schools and colleges and also among general practitioners about role of physiotherapy in anterior knee pain. There was a high positive correlation between anterior knee pain scale and lower extremity functional scale.

Clinical implications to physiotherapy practice.

With growing incidence of osteoarthritis in Indian geriatric population, the role of physical therapy if incorporated at an early interventional level would help in preventing patellofemoral osteoarthritis, as it is proved that anterior knee pain is a precursor of patellofemoral osteoarthritis. [11] As physical therapy awareness is very less, so if Indian adult population is made aware of causes, etiology and also about how physical therapy can help in rehabilitation of anterior knee pain it can prevent patellofemoral osteoarthritis in later life.

ACKNOWLEDGEMENT

Sincere thanks to all the participants of the study.

REFERENCES

1. Taunton JE, Ryan MB, Clement DB, McKenzie DC, Lloyd-Smith DR, Zumbo BD. A retrospective case-control analysis of 2002 running injuries. British Journal of Sports Medicine. 2002;3(6):95-101.
2. Baquie P, Brukner P. Injuries presenting to an Australian sports medicine centre: a 12-month study. Clinical Journal of Sports Medicine. 1997;7:28-31.
3. Duncan RC, Hay EM, Saklatvala J, Croft PR. Prevalence of radiographic osteoarthritis–it all depends on your point of view. Rheumatology (Oxford). 2006;45:757-760.
4. Reid DC. The myth, mystic and frustration of anterior knee pain [Editorial]. Clinical Journal of Sports Medicine. 1993;3:139-43.

5. Sanchis-Alfonso V. Anterior Knee Pain and Patellar Instability. London: Springer-Verlag 2006.
6. Royle SG, Noble J, Davies DR et al (1991). The significance of chondromalacic changes on the patella. Arthroscopy. 1991;7:158-160.
7. Ficat P, Ficat C, Bailleux A (1975). Syndrome d`hyperpression externe de la rotule (S.H.P.E). Rev Chir Orthop. 61: 39-59
8. Hughston JC. Subluxation of the patella. Journal of Bone and Joint Surgery. 1968;50-A: 1003-1026
9. Insall J. "Chondromalacia Patellae": Patellar malalignment syndrome. Orthopaedics Clinics of North America. 1979;10: 117-127.
10. Malcangio M, Garrett NE, Cruwys S et al. Nerve growth factor- and neurotrophin-3-induced changes in nociceptive threshold and the release of substance P from the rat isolated spinal cord. The Journal of Neurosciences. 1997;17;8459-8467
11. Martin J Thomas, Laurence Wood, James Selfe, George Peat. Anterior knee pain in younger adults as a precursor to subsequent patellofemoral osteoarthritis: a systematic review. BMC Musculoskeletal Disorders. 2010, 11:201
12. Barby and Kevin Singer. Anterior Knee Pain Scale. Australian Journal Of Physiotherapy. 2009 vol 25.
13. Cynthia J. Watson, Micah Propps, Jennifer Ratner, David L. Zeigler,Patricia Horton, Susan S. Smith. Reliability and Responsiveness of the Lower Extremity Functional Scale and the Anterior Knee Pain Scale in Patients with Anterior Knee Pain. Journal of Orthopaedic & Sports Physical Therapy. March 2005; (1) Volume 35, Number 3.
14. Binkley JM, Stratford PW, Lott SA, Riddle DL. The Lower Extremity Functional Scale (LEFS): scale development, measurement properties, and clinical application. North American Orthopaedic Rehabilitation Research Network. Physical Therapy .1999 Apr;79(4):371-83
15. Anterior knee pain-The common causes. www.balmainsportsmed.com.au
16. Thomee R, Augustsson J, Karlsson J. Patellofemoral pain syndrome: a review of current issues. Sports Medicine. 1999, Oct 28;(4):245-262
17. Vicente Sanchis-Alfonso. Pathophysiology of Anterior Knee Pain. Springer verlang. 2010
18. Sanchis-Alfonso V, Gastaldi-Orquín E, Martinez-SanJuan V. Usefulness ofcomputed tomography in evaluating the patellofemoral joint before and after Insall´s Realignment. Correlation with short-term clinical results. The American Journal of Knee Surgery 1994;7: 65-72.

How to cite this article: Shroff R, Panhale V. Effect of anterior knee pain on lower extremity functions in young adults. Int J Health Sci Res. 2014;4(12):223-229.

****