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Original Article

Prevalence of Patellofemoral Pain Syndrome Among Sports Sciences Students In Lahore

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ABSTRACT

Patellofemoral pain syndrome is characterized by severe pain around the knee cap during physical activities **Objective:** The aim of this study is to find out prevalence of Patellofemoral Pain Syndrome among Sports Sciences students in Lahore **Methods:** This is an observational study; cross sectional survey with 306 estimated sample size 288 participants were respondents but remaining 18 were non respondents and data is collected from students of sports sciences department in mentioned universities using Kujala Scoring questionnaire. Data is entered and analyzed using SPSS version 21 **Results:** The results shows that age of participants were between 19 to 25 years. Number of male (62.15%) participants were more than female(37.85%) participants .prevalence of PFP among sports sciences students is 63.54%(N=183) with mild or no symptoms of anterior knee pain, 26.74 %(N=77) with moderate symptoms and 9.72% (N=28) with severe symptoms of Patellofemoral pain syndrome **Conclusion:** According to the results we concluded that there are mild or no symptoms of Patellofemoral Pain Syndrome in 63.54 % Sports Sciences Students in Lahore, 26.74 % Sport Sciences Students have moderate symptoms of Anterior Knee joint Pain and 9.72% Sports Sciences Students have severe Symptoms Of Patellofemoral Pain Syndrome

INTRODUCTION

Patellofemoral pain syndrome (PFPS) is a syndrome in which there is pain along with other symptoms around the knee joint patella (Anterior Knee pain). In Sports centers it is also known as Jumper 's or Runner 's knee. Patellofemoral (PF) joint is an articulation between Patella (sesamoid bone) and Femur (thigh bone). Knee pain is limiting factor ADLs as well as multiple sports related activities. Mobility is the important task for active life and hence joints are responsible to maintain ADLs. Knee joint is important for lower limb's mobility and support. In PFPS pain is the limiting factor along with other symptoms. The exact cause of PFPS is not known . PFP can affect knee joint due to altered biomechanics of knee as well as hip joint Multiple underlying causes of PFPs in athletes have been reported which may cause structural changes and can affect the performance of athlete [2] knee pain in athletes is caused due to psychological factors and overload due to strenuous workout which may cause abnormal biomechanical changes. Knee pain can occur in any age but it is found that PFP is more common among young population (adults). It can also effect older population but in old age it occurs mostly due to other age related disorders. Foot mobility is also impaired due to severe pain [3] it is stated that foot mobility is more likely to be reduced in the old age as compared to the young adults [4]. Study suggests that body mass index can also influence knee pain. It states that BMI is raised in PFS and PFOA (Patellofemoral Osteoarthritis) hence it can be used for its diagnosis as well.The incidence and prevalence of PFPS is one in fourteen adolescents at a time and one in five general population [5] females are twice likely to develop PFPS as compared to males. There are multiple causes of knee pain due to various underlying pathological conditions of tendons(Patellar tendinitis), Chondromalacia

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Patella, Dislocations, Trauma, Muscle weakness or tightness, Fractures and Arthritis etc. Pain in PF is felt due to stimulation of pain receptors (nociceptive nerve endings) located in the soft tissue structures and bone around the knee cap (subchondral patellar bone nerves). The pain at knee joints may also occur due to overuse in various athletic activities like running and jumping etc. Symptoms can involve one or both knees. In this syndrome person complaints of pain and stiffness during various daily life activities that involves more loading at knee joint like ascending or descending stairs, squatting, hopping, kneeling, running and activities that causes sustained knee bend or knee flexion. This study [6] demonstrates the complete macroscopic as well as microscopic evaluation of knee joint however quadriceps training and hip strength can be effective to relieve the symptoms.In PFP knee pain is not only common during activities mentioned above but it may occur during sitting [7]. Prolong sitting also causes pain in knee however its cause is unknown that which altered mechanics are responsible for pain during prolonged sitting. PFP's can be caused due to many risk factors including weak strength of knee joint causing its instability. However [8] osteoarthritis causes some abnormal structural changes in the knee joint hence differential diagnosis be done as it is important risk factor in old age. Abnormal joint kinematics may also cause knee joint pain. Increased Q angle is also responsible for PPS 's. Hip joint pathology can also cause changes in the knee joint for example weak vasti and changes in Q angle are also precursor for knee pain. Patellar chondroamalacia is also an important risk factor to cause anterior knee pain [9]. Risk factors for male and female gender are different. Psychological factors are also considered for impaired mobility in PFP [10] anxiety and depression are more dangerous to cause multiple musculoskeletal disorders including knee pain. It is also suggested that fear of pain also limits mobility hence pain related fear is likely to reduce independency.PFP 's can be prevented by overcoming at its risk factors as it is common complaint. Activity modification should also done to prevent knee joint from pain and activity limitation. Strength should be maintained by strengthening of knee joints muscles as well as hip joint muscles (Quadriceps and hip abductors). Overweight and overuse athletic training should also be avoided. Activity modification can also be done to minimize excessive forces acting at knee joints. Biomechanical fault of lower limb joints can also lead to PFPS so it should be addressed as soon as possible to avoid secondary symptoms [11]. Alignment of patella is also important for knee joint stability hence ,track patella properly in its groove .Excess weight should also be reduced. Before athletic training warm up exercises can be done for five minutes to prepare muscles for workout and intensity of workout should be increased gradually. Flexibility and general stretching should also be promoted to avoid PFPS. As PPFS is more common in adolescent and hence sport sciences students are more prone to knee injuries leading to knee pain. Various sports activities can cause PFPS such as gymnastics, soccer, Basketball, Football, hockey, Volleyball and softball. Sports related knee injury can develop PFPS affecting their abilities to participate in certain sport. As running as well as walk of affected participants will be altered due to abnormal loading at PF joint and weak muscles [12]. Walk as well as gait of affected subjects is different from normal person's gait hence participation in sports related activities is not possible without PFPS intervention. It is suggested that in the intervention program of PFPS, gait training should also be included to improve functional capabilities.Physical therapy is most effective for the treatment of PFPS in most of the cases. Patellar bracing or taping can also be used for the management of PFPS if the underlying cause is patellar malpositioning [13]. knee pain in the runners can be reduced with activity modification. It suggests that running with forefoot strike pattern is more likely to reduce pain during running [14]. Multiple options for the management of PFPS are available by targeting its causes from various perspectives. It states that muscle weakness (especially quadriceps) is responsible for altered biomechanics so, proper joint loading should be addressed to relieve symptoms. It is emphasized that such management strategy should be planned which is beneficial rather than causing more irritation in knee joint structures. Therapeutic exercises can also be effective for the management of PFPS [15]. A recent study [16] emphasizes the use of proper biomechanics during daily life activities [17]. Isolated core postural control along with physiotherapy can add greater improvement in pain and function. Moreover, improve functional capability the protonic knee brace can be more effective in pain reduction and movement gain as compared to the other conservative interventions [18]. Dry needling is also used as intervention of pain in PFPS [19]. Altered biomechanics and muscular strength at knee joint can also involve trunk hence postural instability may occur. Loss of trunk muscles proprioception, affected motor control and impaired motor unit recruitment pattern challenges postural stability. Rehabilitation program with sensory and motor training should be designed. Postural control training is beneficial to improve functional outcome.

METHODS

It was a descriptive cross-sectional study design. Data was collected within 04 months after the approval of synopsis

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It was a descriptive cross-sectional study design. Data was collected within 04 months after the approval of synopsis from the concerned authorities. Sample size was 1500. Data was collected from sport sciences students of Imperial College of Business Studies, University of the Punjab and The University of Lahore, Pakistan. Sampling technique was convenient sampling technique.Registered students of sport sciences between 19-25 years of age were included while the participants with any congenital abnormalities of lower limb were excluded. Kujala scoring Questionnaire is used as measurement tool in PFP. This scale is indicator of Pain at anterior knee joint. The Kujala AKPS is a 13 item based self report questionnaire used worldwide to assess Patellofemoral pain in young population (Adults and adolescents). The responses obtained from individuals were evaluated through descriptive analysis by using SPSS 21.0.

RESULTS

The results of research to find out prevalence of PPFS among Sports Sciences Students In Lahore along with description are described as follows: Participants between 19-25 years of age N=168 and participants between 23 -25 years of age N=120 however total number of participants N=288. Result shows that there are more number of participants between 19-22 years then 23-25 years of age(N=168>N=120). Participents of either gender wer included , 179 were male participents and 109 were females participents out of 288 totol participents. Result shows that number of male participants is greater then female participants(N=179>N=109).

Semester	Frequency	Percent	Valid Percent	Cumulative Percent
1st Semester	13	4.5	4.5	4.5
2nd Semester	31	10.8	10.8	15.3
3rd Semester	37	12.8	12.8	28.1
4th Semester	34	11.8	11.8	39.9
5th Semester	56	19.4	19.4	59.4
6th Semester	34	11.8	11.8	71.2
7th Semester	44	15.3	15.3	86.5
8th Semester	39	13.5	13.5	100.0
Total	288	100.0	100.0	

Table 1: Frequency of Patellofemoral pain syndrome

The frequency table shows that for participants of 1st semester N=13,Participants from 2nd semester N=31,Participants from 3rd semester N=37 , Participants from 4th semester N=34 , Paticipants from 5th semester N =56 , Participants from 6th semester N =34 , , Participants from 7th semester N =44, Participants from 8th semester N = 39, and total number of participants are 288(N=288)(Table 1).

Current Sports

Sports	Frequency	Percent	Valid Percent	Cumulative Percent
Running	32	11.1	11.1	11.1
Football	36	12.5	12.5	23.6
Cricket	56	19.4	19.4	43.1
Fencing	15	5.2	5.2	48.3
Hockey	24	8.3	8.3	56.6
Volley Ball	13	4.5	4.5	61.1
Weight bearing	7	2.4	2.4	63.5
Basketball	18	6.2	6.2	69.8
Long Jump	10	3.5	3.5	73.3
Badminton	24	8.3	8.3	81.6
Tennis	14	4.9	4.9	86.5
Rowing	16	5.6	5.6	92.0
Gymnastic	5	1.7	1.7	93.8
Shot put Throw	4	1.4	1.4	95.1
Rugby	8	2.8	2.8	97.9
Archery	6	2.1	2.1	100.0
Total	288	100.0	100.0	

Table 2: Patellofemoral pain syndrome according to type of sports

The frequency table shows that there are 32 Runners (N=32) , 36 participants are Football players(N=36) , 56 Participants are Cricketers (N=56), 15 participants belong to fencing sport(N=15) , 24 participants are Hockey players (N=24) , 13 participants are Volleyball players (N=13) , 7 participants are involved in Weight bearing (N=7) , 18 participants are Basketball players (N=18) , 10 participants are long jumpers (N=10) , 24 participants play Badminton (N=24) , 14 participants are tennis players (N=14) , 16 participants are involved in Rowing (N=16) , 5 participants are involved in Gymnastics (N=5) , 4 participants are involved in Shot put throw , 8 participants are Rugby players (N=8) and 6 participants are involved in Archery (N=6) . According to the frequency table the maximmum participants are cricketers.

Score of Anterior Knee Pain

		Frequency	Percent	Valid Percent	Percent
Valid	Mild or Normal	183	63.5	63.5	63.5
	Moderate	77	26.7	26.7	90.3

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	Severe	28	9.7	9.7	100.0
	Total	288	100.0	100.0	

Table 3: Score of anterior knee pain

The result shows that among N=288 participants N=183 participants had mild or no symptoms of anterior knee pain, N=77 participants had moderate symptoms and N=28 participants had severe symptoms of anterior knee pain.

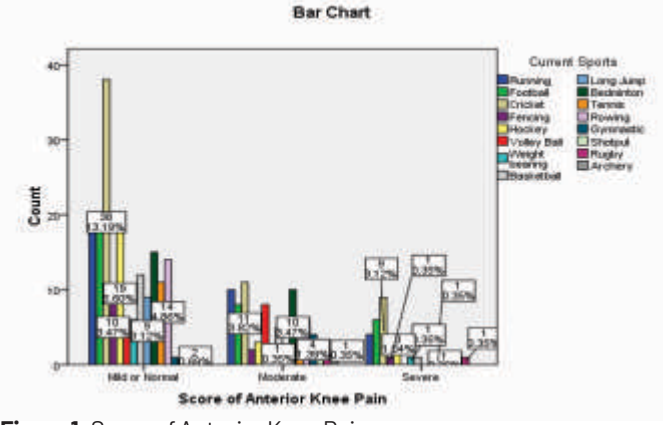

Figure 1: Score of Anterior Knee Pain

The results shows that N=288 and(n= 34) participants are Runners among them 20 participants have mild or no symptoms of PFPS,10 participants have moderate symptoms of anterior knee pain and 4 participants have severe symptoms of PFPS. (n= 33) participants are Football players among them 19 participants have mild or no symptoms of PFPS, 8 participants have moderate symptoms of anterior knee pain and 6 participants have severe symptoms of PFPS . (n= 58) participants are Cricketers among them 38 participants have mild or no symptoms of PFPS, 11 participants have moderate symptoms of anterior knee pain and 9 participants have severe symptoms of PFPS. (n= 13) participants are involved in Fencing Sports among them 10 participants have mild or no symptoms of PFPS, 2 participants have moderate symptoms of anterior knee pain and only 1 participant has severe symptoms of PFPS. (n= 25) participants are Hockey players among them 19 participants have mild or no symptoms of PFP,3 participants have moderate symptoms of anterior knee pain and 3 participants have severe symptoms of PFPS. (n= 14) participants are VolleyBall players among them 6 participants have mild or no symptoms of PFPS, 8 participants have moderate symptoms of anterior knee pain and no participant has severe symptoms of PFPS. (n= 8) participants are involved in Weight bearing sports related activities among them 6 participants have mild or no symptoms of PFPS, 1 participant has moderate symptoms of anterior knee pain and only 1 participant has severe symptoms of PFPS. (n=18) participants are Basketball players among them 12 participants have mild or no symptoms of PFPS, 5 participants have moderate symptoms of anterior knee pain and only 1 participant has severe symptoms of PFPS. (n= 11) participants are Long Jumpers among them 9 participants have mild or no symptoms of PFP,2 participants have moderate symptoms of anterior knee pain and no participant has severe symptoms of PFPS. (n= 25) participants are Badminton players among them 15 participants have mild or no symptoms of PFPS, 10 participants have moderate symptoms of anterior knee pain and no participant has severe symptoms of PFPS. (n= 15) participants are Tennis players among them 11 participants have mild or no symptoms of PFPS, 3 participants have moderate symptoms of anterior knee pain and only 1 participant has severe symptoms of PFPS. (n= 21) participants are Rowers among them 14 participants have mild or no symptoms of PFP,6 participants have moderate symptoms of anterior knee pain and only 1 participant has severe symptoms of PFPS. (n= 5) participants are Gymnasts among them only 1 participant has mild or no symptoms of PFPS, 4 participants have moderate symptoms of anterior knee pain and no participant has severe symptoms of PFPS. (n= 2) participants are Shot-put Throwers and among them only 1 participant has mild or no symptoms of PFPS, 1 participant has moderate symptoms of anterior knee pain and no participant has severe symptoms of PFPS. (n= 3) participants are Rugby Players and among them no participants have mild symptoms of PFPS,2 participants have moderate symptoms of anterior knee pain and 1 participant has severe symptoms of PFPS. (n= 3) participants are Shot-put Throwers and among them only 2 participants have mild or no symptoms of PFPS,1 participant has moderate symptoms of anterior knee pain and no participant has severe symptoms of PFPS.

DISCUSSION

The purpose of this study is to find out prevalence of PFPS among Sports Sciences Students in Lahore. The estimated sample size from Rao Software is 306 but 288 participants responded and remaining 18 were non responders. Data is collected from Sports Sciences Students from three universities in Lahore Imperial College Of Business Studies, The University Of Lahore and University of the Punjab. Kujala Anterior Knee Pain scoring questionnaire is used to find out functional limitations due to PFPS Among Sports Sciences Students. participants were asked to fill questionnaire honestly.More than half (58.33%) participants are between 19-22 years of age among them 34.38% participants have mild or no symptoms ,17.71% have moderate symptoms of PFP and 5.25% participants have severe symptoms of AKP. 41.67% participants are

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between 23 -25 years of age among them according to results 29.17% participants have mild symptoms of PFPS, 9.03% participants have moderate symptoms and 3.47% participants have severe symptoms of PFP. Majority of participants are males (62.15%) and 37.85% participants are females. According to the results 38.54% males have mild or no symptoms of PFPS ,15.62% have moderate and only 7.29% have severe symptoms of PFPS. 25% female participants have mild or no symptoms, 11.11% have moderate symptoms and only 2.43% participants have severe symptoms of patellofemoral pain syndrome. Results shows that 6.94% runners have mild or no symptoms ,3.47% have moderate and 1.39% have severe symptoms . 6.60% Football players have mild or no symptoms of PFPS, 2.78 % have mild 2.08% have severe functional limitation of anterior knee joint. 13.9% Cricketers have mild or no, 3.82 % have moderate and 3.12 % have severe symptoms of PFPS. 3.47 % Fencing sports participants have mild or no ,2.78 % have moderate and 0.35 % have severe symptoms of PFPS. 6.60% Hockey players have mild or no 1.39, % have moderate and 1.39 % have severe symptoms of PFPS. 2.08% Volleyball players have mild or no ,2.78 % have moderate and 0.35% have severe symptoms of PFPS. 2.08 % Weight bearing participants have mild or no ,0.69 % have moderate and 0.35 % have severe symptoms of PFPS. 4.17 % Basketball players have mild or no ,2.08 % have moderate and 0.35 % have severe symptoms of PFP.3.12 % Long jumpers have mild or no ,0.69 % have moderate and 0.35% have severe symptoms of PFPS. 5.21% Badminton players have mild or no ,3.47 % have moderate and 0.35 % have severe symptoms of PFPS. 3.82 % Tennis players have mild or no ,1.39 % have moderate and 0.35 % have severe symptoms of PFPS. 0.35 % Rowers have mild or no ,2.08 % have moderate and 0.35 % have severe symptoms of PFPS. 0.35% Gymnasts have mild or no ,1.39 % have moderate and 0.35 % have severe symptoms of PFPS. 0.35% Shot-puts throwers have mild or no, 0.35 % have moderate and 0.35 % have severe symptoms of PFPS. 0.35% Rugby players have mild or no ,0.35 % have moderate and 0.35 % have severe symptoms of PFPS. 0.69 % Archers have mild or no ,0.69 % have moderate and 0.35 % have severe symptoms of PFPS.

CONCLUSION

According to the results we concluded that there are mild or no symptoms of PFPS in 63.54 % Sports Sciences Students in Lahore,26.74 % Sport Sciences Students have moderate symptoms of Anterior Knee joint Pain and 9.72% Sports Sciences Students have severe Symptoms of PFPS.

REFERENCES

[1] Loudon JK. Biomechanics and pathomechanics of the patellofemoral joint. International Journal of Sports Physical Therapy. 2016;11(6):820-830.

[2] Petersen W, Rembitzki I, Liebau C. Patellofemoral pain in athletes. Open access journal of sports medicine. 2017;8:143. doi: 10.2147/OAJSM.S133406.

[3] Tan JM, Crossley KM, Vicenzino B, Menz HB, Munteanu SE, Collins NJ. Age-related differences in foot mobility in individuals with patellofemoral pain. Journal of foot and ankle research. 2018;11(1):5. doi: 10.1186/s13047-018-0249-2.

[4] Hart HF, Barton CJ, Khan KM, Riel H, Crossley KM. Is body mass index associated with patellofemoral pain and patellofemoral osteoarthritis? A systematic review and meta-regression and analysis. Br J Sports Med. 2017;51(10):781-90. doi: 10.1136/bjsports-2016-096768.

[5] Smith BE, Selfe J, Thacker D, Hendrick P, Bateman M, Moffatt F, et al. Incidence and prevalence of patellofemoral pain: A systematic review and meta-analysis. PloS one. 2018;13(1):e0190892. doi: 10.1371/journal.pone.0190892.

[6] Gaitonde DY, Ericksen A, Robbins RC. Patellofemoral Pain Syndrome. American family physician. 2019;99(2).

[7] Collins NJ, Vicenzino B, Van Der Heijden RA, Van Middelkoop M. Pain during prolonged sitting is a common problem in persons with patellofemoral pain. journal of orthopaedic & sports physical therapy. 2016;46(8):658-63. doi: 10.2519/jospt.2016.6470.

[8] Collins N, Vicenzino B, Macri E, Crossley K. Prevalence and factors associated with radiographic PFJ OA in young to middle-aged adults with chronic patellofemoral pain. Journal of Science and Medicine in Sport. 2015;19:e85. doi: 10.1002/acr.22274.

[9] Boling MC, Nguyen A-D, Padua DA, Cameron KL, Beutler A, Marshall SW. Gender-Specific Risk Factor Profiles for Patellofemoral Pain. Clinical journal of sport medicine: official journal of the Canadian Academy of Sport Medicine. 2021 Jan;31(1):49-56. doi: 10.1097/JSM.0000000000000719.

[10] Maclachlan LR, Collins NJ, Matthews ML, Hodges PW, Vicenzino B. The psychological features of patellofemoral pain: a systematic review. Br J Sports Med. 2017;51(9):732-42. dx.doi.org/10.1136/bjsports-2016-096705

[11] Willy RW, Meira EP. Current concepts in biomechanical interventions for patellofemoral pain. International Journal of Sports Physical Therapy. 2016;11(6):877.

[12] Nourbakhsh S, Bahramian F, Arazpour M, Abutorabi A, Mirzaee F. Patellofemoral Pain Syndrome and Its

DOI: https://doi.org/10.54393/pbmj.v5i1.281

Effect on the Walking of Affected Subjects: Update Review. J Osteopor Phys Act. 2018;6(214):2. doi: 10.4172/2329-9509.1000214

[13] Roper JL, Harding EM, Doerfler D, Dexter JG, Kravitz L, Dufek JS, et al. The effects of gait retraining in runners with patellofemoral pain: A randomized trial. Clinical biomechanics. 2016;35:14-22. doi: 10.1016/j.clinbiomech.2016.03.010.

[14] Bolgla LA, Boling MC, Mace KL, DiStefano MJ, Fithian DC, Powers CM. National Athletic Trainers' Association Position Statement: Management of Individuals With Patellofemoral Pain. Journal of athletic training. 2018;53(9):820-36.

[15] Szabo AL, Neil ER, Games KE. Therapeutic Exercise With Patellofemoral Pain: The Paradigm Shift of Target Musculature. Athletic Training and Sports Health Care. 2019;11(2):57-9. doi.org/10.3928/19425864-20180724-01

[16] Alshaharani MS, Lohman EB, Bahjri K, Harp T, Alameri M, Jaber H, et al. Comparison of Protonics™ Knee Brace to Sport Cord on Knee Pain and Function in Patients With Patellofemoral Pain Syndrome: A Randomized Controlled Trial. Journal of sport rehabilitation. 2019:1-30. doi: 10.1123/jsr.2018-0171.

[17] Foroughi F, Sobhani S, Yoosefinejad AK, Motealleh A. Added Value of Isolated Core Postural Control Training on Knee Pain and Function in Women With Patellofemoral Pain Syndrome: A Randomized Controlled Trial. Archives of physical medicine and rehabilitation. 2019;100(2):220-9. doi: 10.1016/j.apmr.2018.08.180.

[18] Sutlive TG, Golden A, King K, Morris WB, Morrison JE, Moore JH, et al. Short-term effects of trigger point dry needling on pain and disability in subjects with patellofemoral pain syndrome. International journal of sports physical therapy. 2018;13(3):462.

[19] Motealleh A, Yoosefinejad AK, Ghoddosi M, Azhdari N, Pirouzi S. Trunk postural control during unstable sitting differs between patients with patellofemoral pain syndrome and healthy people: A cross-sectional study. The Knee. 2019;26(1):26-32. doi: 10.1016/j.knee.2018.10.002.

[20] Yelvar GY, Baltaci G, Tunay VB, Atay AÖ. The effect of postural stabilization exercises on pain and function in females with patellofemoral pain syndrome. Physiotherapy. 2015;101:e1692-e3. doi: 10.3944/AOTT.2015.13.0118.