Original Study

Prevalence of Patello Femoral Pain Syndrome in Competitive Swimmers: A Cross Sectional Study

Pandavadra Roshani Ranmalbhai[1], Mageswaran Nagrajan[2]

[1]Student, Srinivas College of Physiotherapy and Research Center, Pandeswar Mangalore, Karnataka, [2]Associate Professor, Srinivas College of Physiotherapy and Research Center, Pandeswar Mangalore, Karnataka

How to cite this article: Pandavadra Roshani Ranmalbhai, Mageswaran Nagrajan. Prevalence of Patello Femoral Pain Syndrome in Competitive Swimmers: A Cross Sectional Study. Indian Journal of Physiotherapy and Occupational Therapy 2023;17(4).

Abstract

Objectives: To find out and know the prevalence of patello-femoral pain syndrome in competitive swimmers.

Study Design: A cross sectional study.

Study Setting: various swimming clubs around India

Participants: Competitive swimmers

Methodology: Firstly, various sports clubs and recreational clubs and university sports clubs in and around India was approached. After getting permission from the clubs, informed consent was obtained from the athletes. Then, questionnaire was distributed to the athletes. Then, based on the information collected from questionnaire, the athletes were chosen for screening of inclusion and exclusion criteria.

Results: only 10% prevalence found out of 100 competitive swimmers. Of them breast stroke and butterfly swimmers found 0% prevalence And in back stroke 6% prevalence and in free style 4% prevalence has been found. CONCLUSION: The study concluded that swimmers who uses back stroke and free style, have 10% chances of PFPS. Therefore, PFPS is very less prevalent in swimmers.

Key words: PFPS, runner's knee, Competitive swimmers, Flutter kick.

Introduction

Competitive swimmers are predisposed to musculoskeletal injuries of the upper limb, knee, and spine. This study highlights the epidemiology of injuries to competitive swimmers and provides prevention strategies for the sports health professional. Swimming is a unique sport that combines upper and lower extremity strengthening exercises with cardiovascular training in a non-weight bearing environment. A 5 year survey from National College Athletic Association revealed that overall elite swimmer injury rates were 4.00 injuries per 1000 hours of training.[1]

Four strokes are recognized in competitive swimming: (1) Freestyle (Front crawl stroke) (2) Butterfly (3) Backstroke (4) Breaststroke. The prevalence of musculoskeletal injuries in competitive swimmers is – shoulder - 37%, knee - 28%, spine -

Corresponding Author: Pandavadra Roshani Ranmalbhai, Student, SrinivasCollege of Physiotherapy and Research Center, Pandeswar Mangalore, Karnataka.

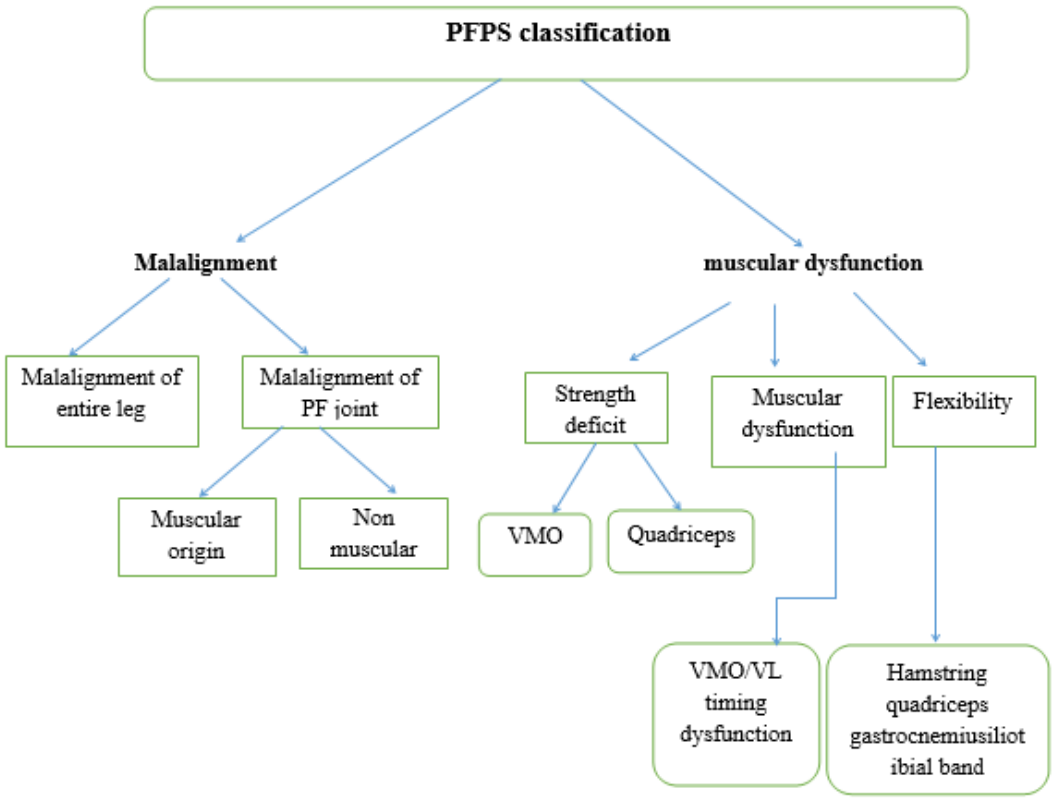
E-mail: Ph.rosh3194@gmail.com

22.2% and the foot and ankle - 19%. Knee is second most reported source of pain in competitive swimmers.[1, 2, 3]

Swimming injuries primarily arise from Activity exposure in terms of distance covered range from 9 km/week at club level to 110 km/week at international level. Knee is second most reported source of pain in competitive swimmer. The kicking action of legs serves as a secondary propulsive force in back stroke, free style and butterfly. In flutter kick, there is repetitive quadriceps contraction which may lead to knee pain because of cumulative patello-femoral over load. High patello-femoral contact stress is also generated during push off from the wall because of forceful quadriceps contraction. This results in increasing patellofemoral contact stresses leading to anterior knee pain.[4,5]

Anterior knee pain is also known as patellofemoral pain syndrome (PFPS).PFPS is a common musculoskeletal condition characterised by anterior knee pain in activities that load the patellofemoral joint. The common signs and symptoms are – 1) Anterior or peri-patellar or retro patellar knee pain.2) Pain on Squatting, ascending or descending stairs.3) Pain on Prolonged sitting with knee flexion (movie or cinema sign).Majority of the scientific literature describing injuries in swimmers concentrates on swimmer's shoulder, hip abductor injury, MCL knee injury and lumbar disc injuries. The literature describing other injuries particularly PFPS is spars.

Malalignment



Abbreviation for PFPS classification

PFPS: Patello Femoral Pain Syndrome

PF: Patello Femoral

VMO: Vastus Medialis obliquus

VL: Vastus Lateralis

Aim and Objective

To find out and know the prevalence of Patello-femoral pain syndrome in competitive swimmers.

HYPOTHESIS

Research hypothesis: Patellofemoral pain syndrome will be prevalent among professional swimmers in India.

Null hypothesis: Patello femoral pain syndrome is not prevalent in competitive swimmers.

Review of Literature

1. **Scoring of Patellofemoral Disorders.[16](1993),**

   A study conducted on new questionnaire was used to evaluate subjective symptoms and functional limitations in Patellofemoral disorders. They concluded that a tendency to lateral patellar tilt during quadriceps contraction causes anterior knee pain and can be imaged in knee extension when the patella is not fully supported by femoral condyles.

2. **Evaluate subjective symptoms and functional limitations in Patellofemoral disorders.(1993)**

   A study was conducted on evaluation of symptoms and functional limitations. They have concluded that Kujala Scoring can be used as a standardized tool to diagose anterior knee pain patient.

3. **Prevalent knee pain and sport.[12] (1998),**

   A study was conducted on knee pain in active athletes. 339 athletes gave information about occupation sports activity and different features of knee pain based on self-filled questionnaire. The study concluded Constant or recurrent knee pain was positively associated with swimming. The prevalence. is associated with the type, amount and duration of sports participation.

4. **Knee pain in competitive swimming.[5](1999),**

   A study was conducted on knee pain in competitive swimmers. They found that 75% of swimmers reported at least three episodes of knee pain per season, and 47% of these swimmers reported weekly episodes of knee pain; the incidence of bilateral symptoms was equal to the incidence of unilateral symptoms. The data indicated knee pain is quite common in swimmers

5. **Clinical classification of patellofemoral pain syndrome.[9](2005),**

   A study was conducted on clinical classification of patellofemoral pain syndrome. In this study they introduced a classification system, which reflects a consents reached by the European Rehabilitation Panel. This classification system helped the clinicians to identify the causes of patellofemoral pain, and consequently help to select the most appropriate non-operative treatment. This study, therefore offers a classification system that provides the clinician with guidelines to classify and treat PFPS patients.

6. **Diagnostic value of five clinical tests in patello femoral painsyndrome.[13] (2006),**

   A study was conducted on validity of five clinical patellofemoral tests used in the diagnosis of PFPS. An investigator performed the vastusmedialis coordination test, patellar apprehension test, Waldron's test, Clarke's test, and the eccentric step test. In this study they concluded that the vastusmedialis coordination test, patellarapprehension test, Clarke's test, and the eccentric step test are more sensitive to diagnose PFPS.

7. **Short-Term Effects of Hip Abductors and Lateral Rotators Strengthening in Females With Patellofemoral Pain Syndrome: A Randomized Controlled Clinical Trial.[18](2010),**

   A study conducted on to investigate the influence of strengthening the hip abductor and lateral rotator musculature on pain and function of females with Patellofemoral pain syndrome. Seventy females, with a diagnosis of unilateral PFPS, were distributed randomly into 3 groups: 22 females in the knee exercise group, who received a conventional treatment that emphasized stretching and strengthening of the knee musculature; 23 females in the knee and hip exercise group, who performed exercises to strengthen the hip abductors and external rotators in addition to the same exercises performed by those in the knee exercise group; and of the 25 females who did not

receive any treatment. They concluded that Rehabilitation programs focusing on knee strengthening exercises and knee strengthening exercises supplemented by hip strengthening exercises were both effective in improving function and reducing pain in sedentary women with PFPS. Improvements of pain and function were greater for the group that performed the hip strengthening exercises, but the difference was significant only for pain rating while descending stairs.

8. **Epidemiology of injuries and prevention strategies in competitive swimmers.[1] (2012),**

   A systemic review was conducted on prevalence of musculoskeletal injuries in swimmers. A literature search was performed by a review of Google Scholar, OVID, and PubMed. The study included Articles published from 1972 to 2011. They concluded that the epidemiology of the upper limb, knee and spine injuries in competitive swimmers and provided prevention strategies for sports health profession.

9. **Persian translation and validation of the Kujala Patellof femoral Scale in patients with Patellofemoral pain syndrome.[6](2012),**

   A study was conducted to culturally translate and validate the kujala Patellofemoral scale and to find test-retest reliability, internal consistency, construct validity with 100 PFPS patients. They found test retest reliability=64.4, ICC=0.96. The study concluded that kujala Patellofemoral scale is a reliable and valid outcome measure.

10. **The relationship of breaststroke training on knee pain and q angle of breaststroke and crawl swimmers.[19](2014),**

    A study was conducted to determine the biomechanical and anatomical factors which predispose subjects to injury. This study included 60 breaststroke and crawl swimmers (16 ±3.2 years old) who participated in 3–6-year-long swimming training in Tabriz city. The knee pain was evaluated with McGill's pain questionnaire, and Q angle was measured with universal goniometry by knee radiography in standing position. The medial pain of knee joint increased significantly and the knee was only symptomatic when the swimmers performed the whip kick. Breaststroke swimmers were hardly able to complete training because of the knee pain. It is concluded that competitive training of breaststroke swimming for 6 months can cause exclusive injury and pain in swimmer's knee. On the other hand, the result showed that there is a direct relationship between the swimmer's Q angle amount and chance of the knee injury. This emphasizes a scrious consideration of Q angle states in breaststroke swimmers.

Methodology

Study design: A cross sectional study

Study population: competitive swimmers

Study sample size: As per the availability of competitive swimmers

Study setting: various swimming clubs in India

Study Duration: April 2017 to March 2018

Criteria for Selection:

Inclusion criteria

1. Age between 18 to 35
2. Competitive Swimmers
3. Anterior Pain in one or both knee on daily basis for at least previous 3 months History of insidious onset
4. Pain with at least 3 of the following tests:
   a. compression of patella against femur at rest – Patella grinding test
   b. quadriceps contraction with knee extended
   c. palpation of posteromedial and posterolateral border of the patella
   d. resisted isometric quadriceps muscle contraction at 60 degrees of flexion, squatting, stair climbing, kneeling or prolonged sitting
   e. Subjects who can read and write English

Exclusion criteria

- Subject will be excluded if they have a history of
  a. Patellar dislocation
  b. Knee surgery in past 1 year
  c. Concomitant diagnosis of bursitis, internal knee derangement, systemic arthritis, ligamentous knee injury or laxity, peripatellar tendonitis, plica syndrome, infection of the knee or cancer
  d. Concomitant musculoskeletal or neurological impairment in the involved lower extremity that influenced their gait
  e. Pregnancy

Materials Used:

a. Height measurement scale
b. Weighing machine

Data collection procedure:

The study was conducted in the year April 2017 to March 2018, in & around different cities of India. Competitive Swimmers attending Swimming classes were invited to complete a survey. Proper evaluation was done and the subjects were included and excluded based on the eligibility criteria. A written consent was taken from the participants for their voluntary participation, before filling the self-administered questionnaire. Participants were supposed to fill the consent form (Annexure-I).Validated questionnaires were printed and were made available to Participants through personal visits. The questions were asked in English. Participants were given a brief explanation about the type of study, its need significance and the benefits. They were explained about how to fill the questionnaires. The completed copies of the questionnaire were collected through personal visits in the respective Swimming classess in due time frame. The study procedures were approved by Ethical Review Board of Srinivas College of Physiotherapy and Research Centre, Pandeshwar, Mangalore, Dakshina Kannada District under Rajiv Gandhi University of Health Sciences, Bangalore, India.

Results

Total 100 competitive swimmers male and female using different style, were screened among Indian population. 10 competitive swimmers out of 100 were found to be suffering from PFPS; making overall prevalence 10% among them highest prevalence was found in freestyle and backstroke users.

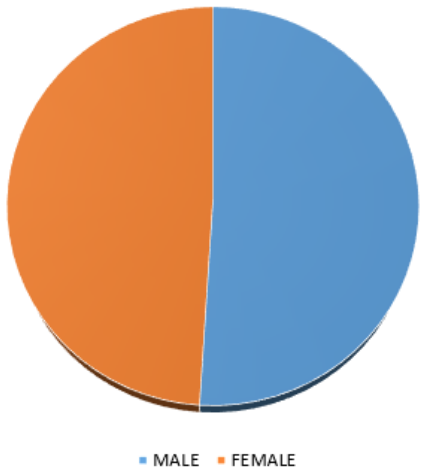


Fig 1 showing male female ratio

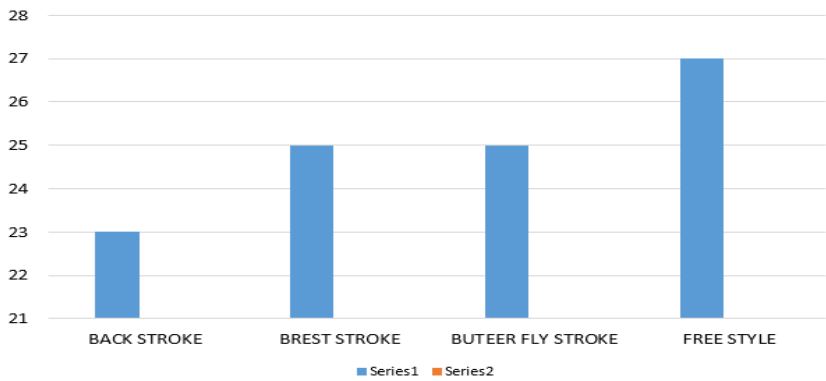


Fig 2 showing number of swimmers in each style

Table 1 showing prevalence of PFPS in different styles of swimming

STYLES OF SWIMMING	yes(%)	No(%)
BACK STROKE	6	94
BREAST STROKE	0	100
BUTTERFLY STROKE	0	100
FREE STYLE STROKE	4	96

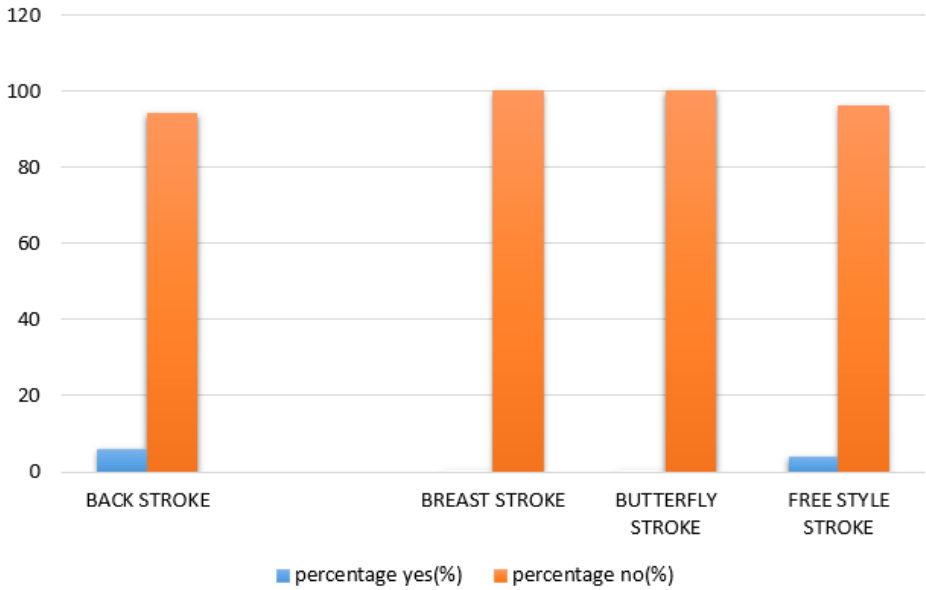


Fig 3 showing prevalence of PFPS in different styles of swimming

Discussion

As PFPS is multi-factorial condition. In swimmers there are chances of occurrence of PFPS because of few faulty techniques. In present study, results were computed based on the information of competitive swimmers, who participated in state and national level competition.

This is the 1st study intended to know the prevalence of PFPS among competitive swimmers in Indian population. Based on information gathered the overall prevalence is 10%. It is prevalent only in free style and back stroke swimmers, which proves that there is less chances of occurrence of anterior knee pain in competitive swimmer. None of the swimmers having PFPS who swim the butterfly and breast stroke.

This study showed that swimmers who swim backstroke and free style were having low prevalence rate (10%) as compare who swim other style. because in backstroke and freestyle, flutter kicking action of legs serves as secondary propulsive force.[5]

Previous literatures have given the hypothetical reason that due to repetitive quadriceps contraction leads to an overload on PFJ and leads to an anterior knee pain.[5]

The diagnosis of PFPS was done on the basis of information gathered from screening questionnaire which comprise a knee pain map, clinical examinations including patellar grinding test, stepdown test and pain on palpation among 10 swimmers suffering from PFPS.

Limitations of this study were we have not used MRI for the further confirmation of diagnosis of PFPS, as MRI increase the likelihood of clinical diagnosis.

We have found that none of the swimmers discontinued from the competition despite suffering from PFPS, further studies can be done on finding the risk factors of PFPS in Indian competitive swimmers. On larger scale across country furthermore this study will be helpful in educating therapists, coaches, competitive swimmers also it will be helpful in developing preventive measures for PFPS.

Conclusion

➢ The major findings of this study were;

- There is a low prevalence of Patellofemoral pain syndrome.
- Chances of PFPS only in, who swim back stroke and free style.
- PFPS is not prevalent in swimmers who swim breast stroke and butterfly stroke.

Conflict of Interest: There is no conflict of interest declared in this study

Source of Funding: This Self funded

Ethical Clearance: Ethical Committee of Srinivas Group of College

References

1. Florian wanivenhaus, alicen Fox J.S., slma Chaudhury, Scott A Rodeo. Epidemiology of injuries and prevention strategies in competitive swimmers. Sports Health. 2012may; 4(3):246-251.
2. Barbara Oliveira Venancio, Pascale MuttiTacani, Paulo Cesar Porto Deliberato. pain prevalence in swimming athletes. Rev bras med esporte. 2012 nov ;18(6):394-399.
3. Marilyn M. pink, George T, Edelman, Russell Mark, and Scott A.Rodeo.Applied biomechanics of swimming. 2016 ; 4(3): 57-73.
4. Trevor Gaunt ,Nicola Maffulli . Soothing suffering swimmers : a systematic review of the epidemiology, diagnosis, treatment and rehabilitation of musculoskeletal .injuries in competitive swimmers. 2011 September 4; 103:45-88.
5. Scott A, Rodeo . Knee pain in competitive swimming. Clin Sports Med. 1999; 18(2):379-387.
6. Negahban H, Pouretezad M, Yazdi MJS, et al. Persian translation and validation of the Kujala Patellofemoral Scale in patients with patellofemoral pain syndrome. DisabilRehabil. 2012; 34(26):2259-2263.
7. Guy Hains, fracoishains. Patellofemoral pain syndrome managed by ischemic compression to the trigger points located in the peri-patellar and retro-patellar areas: A randomized clinical trial. 2010; 13:201-209.
8. Josh cleland, Meghann McRae. Ptellofemoral pain syndrome: A Critial Analysis of Current Concepts. Phys Ther Rev.2013july; 7:153-161.
9. Erik witrouw, S.Werner ,C. Mikkelsen et al . Clinical classification of patellofemoral pain syndrome : guidelines for non-operative treatment. KneeSurg Sports TraumatolArthrosc. 2005;13:122-130.
10. Sara R. Piva, Edward, John D. Strength Around the Hip and Flexibility of Soft Tissues in Individuals With and Without Patellofemoral Pain Syndrome. JOrthop Sports PhysTher . 2005; 35(12):793-801.
11. Kurt Grote, Todd L, Lincoln, James G. Gamble. Hip Adductor Injury in Competitive Swimmers.:Orthop J Sports Med.2004; 32(1):104-108.
12. T. Hahn, A. Foldspang. Prevalent knee pain and sport. Scand J Soc Med.1998; 26(1):42-52
13. J. Nijs et al. diagnostic value of five clinical tests in Patellofemoral pain syndrome. Manual Therapy2006;11: 69–7770
14. Christian Swann, Aidan Moran, David Piggott. Defining elite athletes: Issues in the study of expert performance in sport psychology. Psychol Sport Exerc; 2014:1-12.
15. Jo Nijsa,b, Catherine Van Geela, Cindy Van der auweraa, Bart Van de Veldea.manual therapy.2006;11:69-77.
16. Urho M. Kujala et al. Scoring of Patellofemoral Disorders. The Journal of Arthroscopic and Related Surgery.1993;9(2):15-163.
17. Matheus Oliveira de Almeida, Luiz Carlos Hespanhol, Alexandre Dias Lopes. Prevalence of musculoskeletal pain among swimmers in an elite national tournament. IJSPT. 2015;7:1026-1037.
18. Thiago Yukio Fukuda, Flavio Marcondesrossetto, Eduardo Magalhães, Flavio Fernandes Bryk, Paulo roBertogarcialucareli, nilzaaParecida de al Meidacarvalho, Short-Term Effects of Hip Abductors and Lateral Rotators Strengthening in Females With Patellofemoral Pain Syndrome: A Randomized Controlled Clinical Trial. 2010;40:736-741.
19. Mehrdad Hefzollesan, C Asghar Tofighi, 2, BahramJamali Qarakhanlou, 3, ohrab Ghalehgir1. The relationship of breaststroke training on knee pain and q angle of breaststroke and crawl swimmers. 2014;7(3):29-36.