Original Article

Comparison of Anterior Knee Pain in Adolescent Athletes Participating in Single Sport and in Multiple Sports

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ABSTRACT

Objective: The objective of this study was to determine that whether the occurrence of anterior knee pain is greater in athletes excelling in single sports other than those participating in multiple sports. The secondary objective of this study was to give awareness to athletes.

Study Design: A cross-sectional analytical study

Place and Duration of Study: This study was conducted at the Physiotherapy Department, Fatima Memorial Hospital, Lahore. The duration of this study was 4 months after approval of synopsis.

Materials and Methods: This was a cross-sectional analytical study conducted on 108 adolescents aged between 13-18 years. Non-probability convenient sampling technique was used. Standardized questionnaire Anterior Knee Pain Scale (AKPS) was instrumental tool for this research and Mann-Whitney U test was used to analyze data.

Results: Mean age of athletes was 15.89±1.726 years with minimum of 13 years and maximum of 18 years. Among all the participants, 47.2% were males and 52.8% were females. Results showed a significant difference in the pain between the groups, with greater pain in single sport group than in multiple sports group, with p-value = <0.01.

Conclusion: For athletes, to participate in multiple sports, is more beneficial than to participate in single sport. Participation in multiple sports would reduce the chances to have acute and chronic knee problems mainly the patellofemoral pain.

Key Words: Anterior knee pain, athletes, overuse injuries, patella-femoral pain, sports

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INTRODUCTION

Anterior knee pain due to overuse, fractures, sprains and strains are some common sports injuries.**(1)** Anterior knee pain is also commonly known as "runner's knee or patellofemoral pain syndrome. 30% of the adolescent population is affected by anterior knee pain and 2 to times more prevalent in female. In athletes the prevalence of anterior knee pain is greater than 20% than other population[(2)] 1 in 4 athletes have anterior knee pain, 70% of whom are between the ages of 16 and 25. As the patellofemoral joint is one of the most highly loaded joints in the human body, the prevalence of anterior knee pain is obvious.

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Athletes having AKP present a significant diagnostic and therapeutic challenge for the sport medicine caregiver.[(3)]

74% of the athletes have to limit their sport participation and in some cases to cease sport participation altogether because of anterior knee pain. The pain affects the quality of life of the athletes [(5)]

70% to 90 % of athletes with anterior knee pain have recurrent or chronic pain. Furthermore, anterior knee pain is also associated with the future development of patellofemoral osteoarthritis. Rather than pain, disability is another element found in patients with anterior knee pain[(6)] Overloading on patellofemoral joint and intense physical activity leads towards the development of anterior knee pain.[(6)] Patella is supported and stabilized in the femoral groove by the surrounding soft tissues and bony attachments

Abnormal tracking and malalignment and of the patella contributes to anterior knee pain.[(7) (8)] Sports have been a major leisure activity.[(9)] Adolescent participating in multiple sports in accordance to their interest get good mental and physical health.**(10)** The repetition of the same activity with the same pace and for various hours, leads mainly to overuse injury.**(11)** There is a direct relation between training duration, intensity and over-use injury. Focusing in specialization in single sport leads to the repetition of the same movement in the

same way over and over again. [12] The rationale of this study is to aware the parents and trainers not to force children to pursue a single sport to specialize without understanding proper precautions, to aware the teenagers the benefits of multi-sport, to help the institutions to set a balanced duration and intensity of the sport being played and to tell them the consequences if they continue to pursue single sport without proper guidance.

MATERIALS AND METHODS

This was a cross-sectional analytical study. The duration of this study was 4 months after approval of synopsis. Sample size was calculated by using following formula:

$$n = \frac{\left\{z_{1-\alpha}\sqrt{2\bar{P}(1-\bar{P})} + z_{1-\beta}\sqrt{P_1(1-P_1)+P_2(1-P_2)}\right\}^2}{(P_1-P_2)^2}$$

$$n = 108$$

Keeping confidence interval 99%, anticipated population proportion P_1 = 0.34 and anticipated population proportion P_2 = 0.65 [14] and absolute precision 0.01

Group 1 (Single Sport) = 54

Group 2 (Multiple Sports) = 54

Athletes aging between 13-18 years[14] who were in sports for at least 2-3 years, used to have training hours between 2-3 hours for 4 days a week[1] were included. In addition, athletes who had history of trauma, surgical history, any structural or congenital abnormality in hip, knee and foot joint which may cause anterior knee pain, had muscular weakness were excluded. Data were collected by using non probability convenient sampling technique from Forman Christian College, Kinnaird College, Sacred Heart Convent School, Lahore College, Crescent and other schools/universities/colleges having a sports setup where there were regular and occasional training programs. After the permission was taken from the respective institute and coach and once the inclusion, exclusion criteria met the participants and the athletes had shown willful interest, they were given a brief description proceeding forward to data collection. Data of anterior knee pain in the athletes were taken through the standardized questionnaire, Anterior Knee Pain Scale (AKPS- have high internal consistency; α_{coef} = 0.83 to 0.9)[15] which is broadly used to assess the signs and symptoms of patellofemoral pain in orthopedic and sports medicine. Ethical approval was taken from ethical review committee of Kanaan Physiotherapy & spine clinic with ref. no. PT/2020/REC/IRB/118

Data Analysis: Statistical packages for social sciences version 23 (SPSS 23.0) was used to analyze data. Descriptive statistics including frequencies and percentages were extracted for qualitative variables. Mean and Standard deviation was calculated for the continuous variables. Data were checked primarily for its normal distribution by applying normality tests (Shapiro-Wilk test & Kolmogorov-Smirnov test). Both tests showed value less than 0.05 (α = <0.001) which meant data were not normally distributed. Hence, to test the hypothesis, Mann-Whitney U test; non parametric test for independent t-test was used.

RESULTS

The study conducted, focuses on comparing anterior knee pain in athletes participating in single and multiple sports. Following tables and graphs are presented which help to conclude the results to determine which group of athlete presented with greater pain in knee.

Table No.1: Descriptive statistics for age and anterior knee pain score

Age (years)	Mean	15.89
	Standard Deviation	±1.726
	Minimum	13
	Maximum	18
Anterior Knee Pain Score	Mean	88.09
	Standard Deviation	±13.55
	Minimum	38
	Maximum	100

This table showed the statistics of age of the subjects involved in the study. The distribution of subjects according to age shows a mean value 15.89±1.726.

Table No.2: Descriptive statistics for Anterior Knee Pain Scale score

Anterior Knee Pain Scale's Score in Single Sports Group		
Mean		Standard Deviation
Statistics	S.E Mean	Statistics
82.43	2.072	15.227
Anterior Knee Pain Scale's Score in Multiple Sports Group		
Statistics	S.E Mean	Statistics
93.76	1.166	8.565

Table No.3: Descriptive statistics for gender and sports groups of participants

Variable	Construct	Frequency	Percentage
Gender	Male	51	47.2%
	Female	57	52.8%
Sports Group	Single sports	54	50.0%
	Multiple sports	54	50.0%

The table shows the statistics of the gender of athletes involved in the study, out of which 47.2% were male and 52.8% were female. This table shows that the participants included in each sports group were equal in number according to the sample size.

Normality tests were applied to evaluate data distribution, the results of tests of normality (Kolmogorov-Smirnov, Shapiro-Wilk test) showed a p-

value of less than 0.05 that meant insignificant results and the data not normally distributed thus, a non-parametric test, Mann-Whitney U test was applied. (Table-4).

Table No.4: Tests of Normality

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
AKPS scoring	0.190	108	0.000	0.814	108	0.000

DISCUSSION

In the study 108 athletes have participated with minimum age of 13 and maximum age of 18 years ± 1.726. There were 42.7% male and 58.3% female participants. The results of the study showed that there is a significant difference, with p value being 0.00, in the occurrence of anterior knee pain in both single and multiple sports athletes. The significant difference shows that if athletes participate in single sports rather than multiple sports, they will go through knee problems in near future. Similar to the current study another study conducted by Robert M. Malina on the young athletes concluded that such isolation and focus on a single sport causes growth impairments and place a risk for overuse injuries.[16]

A clinical case control study conducted by Neeru A. Jayanthi on 1214 athletes from ages 7-18 years concluded that sport specialization is an independent risk factor for injury with p value= <0.01.[1] The results of the study is in accordance with the results of the current study both the studies are proposing that the for adolescent athlete single sport specialization is an independent risk factor for injury, with a greater percentage of injury to the knee.

In contrast to the current study a study worked on the relationship between body-composition of female athlete and patellofemoral pain. The study concluded that though the number of athletes having PFP increased over the course of study, it was not found to be related to their BMI, as it remained constant or nearly constant. The concluded that increases in PFP is due to other risk factors which needed to be documented.[17] Therefore exclusion of these factors leads us to find the factors which caused PFP in adolescent female athlete. Which the current study determined to be: excess focus on specialization in a single sport and adolescent age.

Just like the current study Job Fransen conducted a study to find out the difference in physical fitness and gross motor coordination among boys (6-12 years old) who participated in single and multiple sports. In contrast to current study this study worked on boys only. This study concluded that boys participating in multiple sports had better flexibility, speed, strength, cardio-vascular endurance and gross motor coordination, than boys participating in single sports.[18] The results of this study highly correlate with the current study conducted, stating that participating in multiple sports is beneficial in many ways to the athlete, than single sport. Current studies goes with the literature as many studies found that there are greater chances of knee injuries in athletes who participated in single sport rather than multiple sports.[11] [10, 19] So, it is recommended to the athletes to engage themselves in multiple sports and to take breaks between their sports practicing regime to avoid such sports injuries.

CONCLUSION

Athletes who take part in a single sport have greater occurrence of anterior knee pain than those who participate in multiple sports.

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Limitations and Recommendations: There was less diversity in sample. Athletes were reluctant in accepting their problems, as they thought it as a norm due to lack of awareness. Non-cooperative male athletes hindered the collection of data and reduced diversity.

Further extensive and exploratory researches should be done to find out sports specific factors and pain relationships with larger sample populations. Coaches and parents should not force adolescent athlete to excel in a single sport only for material purposes. Coaches should promote the participation of athletes in multiple sports. It is recommended that as vigorous training in a single sport would cause, acute or delayed knee functional disability, therefore training hours and the number of sports should be managed according to the health concerns of the athlete.

Author's Contribution:

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Conflict of Interest: The study has no conflict of interest to declare by any author.

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