Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/j3pc2q08

PREVALENCE OF SHOULDER PAIN, TENNIS ELBOW AND WRIST PAIN AMONG BADMINTON PLAYERS IN GREATER NOIDA

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Abstract
This study aimed to examine the interrelationships between shoulder, elbow, and wrist pain and disability among badminton players using three self-reported outcome measures: the Shoulder Pain and Disability Index (SPADI), the Patient-Rated Tennis Elbow Evaluation (PRTEE), and the Patient-Rated Wrist Evaluation (PRWE). A total of 50 badminton players who met predefined inclusion and exclusion criteria were enrolled. Each participant provided informed consent and completed demographic forms, followed by baseline assessments using the SPADI, PRTEE, and PRWE tools. Statistical analysis revealed no significant associations between gender and the SPADI, PRTEE, or PRWE scores. Similarly, age showed no significant correlation with any of the three outcome measures, indicating that neither gender nor age influenced the severity of reported pain or disability. However, strong and significant positive correlations were found between SPADI and PRTEE, as well as between SPADI and PRWE. Moreover, an especially high correlation was noted between PRTEE and PRWE, suggesting a close interdependence between elbow and wrist discomfort and functional limitations. These findings imply that increases in pain or disability in one anatomical region are likely to be accompanied by increases in others, particularly among upper limb joints that are functionally interconnected in overhead sports like badminton. The study underscores the importance of comprehensive upper limb assessment in athletes, as localized pain may reflect broader musculoskeletal involvement. Further research is recommended to explore causal relationships and potential biomechanical factors underlying these correlations in racquet sport athletes.

INTRODUCTION

In INDIA, badminton is the second most popular sport [1]. It is non-contact.(2) a racquet sport that calls for a variety of awkward body positions and hops, lunges, and movements. rapid arm movements, direction changes, and bursts [2]. The body could be at risk for a number of injuries during such motions. As a result, while playing the sport, badminton players frequently sustain various types of injuries [3]. Badminton is the second most popular sport in India [1], so it's important to comprehend the prevalence of injuries in this sport in order to identify risk factors and put preventive measures in place. A better training schedule will lower the risk of injury and raise the standard of training by increasing coaches' understanding of the problem. This study will offer unbiased data and information to physiotherapists working in India at recreational clubs, badminton institutes, etc.in order to create a better training advice program for athletes and reduce the chance of injury, both of which will help to increase performance more effectively(2).

The majority of injuries associated with badminton were chronic overuse injuries, according to L.D. Hensey, who also claims that badminton is a sport with a low risk overall.7 Because it is a rapid sport,

swift movements and abrupt direction changes are necessary. Sports-related injuries are frequent owing to player, ground, object, and other contact, as well as other factors like pressure, overuse, and falls.

Injury-causing weakness is another frequent factor. Knowing the mechanism, the injury extension, and the preventative measures are some of the elements to take into consider. In order to preserve the injured tissues and aid in pain management and healing during the inflammatory period, appropriate training and therapy are essential. It also enhances muscle strength, proprioception, balance, and flexibility, which all contribute to better game play.8 (1)during the performance, repetitive loading**.**

Badminton frequently causes injuries despite not being a contact sport. These include overuse injuries as well as recent traumatic events. Players must frequently shift their posture while executing challenging activities like lunges, reaches, retrievals, and hops in this physically demanding game. A significant amount of stress is also placed on the upper extremity by frequently used overhead forehand and backhand strokes, deception, and extremely quick hitting actions [2]. Based on population and playing time, the injury rate in badminton ranges from 1 to 7 per 1000 hours of play(1).Compared to female athletes, male athletes are more susceptible to injury. The incidence does not significantly differ between the sexes, though, when the greater percentage of male players who participate is taken into account. [10] However, the injury rate (IR) did significantly rise with age, and in all age groups, female players were injured more frequently than male players.

It is possible that the age-related increase in IR is caused by the mechanical pressure placed on athletes during matches, which rises with level of competition. There may be some variation in the fundamental physical strength across sexes, which could help to explain the variations in IR. [1](3)

Badminton is the quickest and most intense racket sport there is. Athletes must be quick and efficient in their movements to succeed in this sport. All athletes need a lot of energy. The athletes must be durable, technically proficient, quick, have incredible stamina, and be precise in order to present a compelling case. Additionally, it calls for physical stamina and good coordination.Since there is a high risk of injury, playing badminton during both practice and competition is dangerous [1], [2].(4) .

Badminton differs from other sports in that it necessitates greater shoulder mobility because hitting the shuttlecock exerts a significant amount of force on the shoulder joint [3]. The shoulder is subjected to significant loading during repeated strokes because arm rotation, particularly at the shoulder, is a crucial component of strokes. In a Malaysian study of 469 elite badminton players, 18 percent had arm injuries, of which 36 percent were shoulder injuries. Similar results were obtained when 57 Japanese Olympians were surveyed; 18% of them reported shoulder injuries [5]. The shoulder joint plays an important role in the transfer of force from the legs and trunk to the arms when playing badminton [6, 7]. Performance may be hampered by shoulder pain because it may be challenging to coordinate the kinetic chain. (6)

The shoulder girdle faces special challenges from athletes who engage in repetitive overhead movements [1]. Over 30% of all injuries in overhead athletes occur at the gleno(5)humeral joint [2]. Throwers' dominant arm's glenohumeral joint external rotation range of motion (ROM) is larger than that of their non-dominant arm. Glenohumeral internal rotation deficit (GIRD) [3] is the term used to describe this reduction in glenohumeral joint internal rotation range of motion in the dominant shoulder. It is thought to be an anatomically maladaptive change and turns pathological when it is connected to a loss of total rotation of more than 5 degrees in the throwing shoulder as opposed to the non-throwing shoulder [4].(5)

Stability is required because the scapula needs to move in unison in order for overhead sports to be successful. Whether or not the person experiences symptoms, the altered scapular motion increases their risk of later shoulder-related illnesses. [16] The classic method for identifying SD is scapular winging, which is caused by serratus anterior weakness. Performance is consequently impacted.(7).

A common orthopedic condition in professional athletes, such as badminton and tennis players, is tennis elbow, also known as lateral epicondylitis (LE). LE is experienced by 7% of professional athletes [3].

No overt differences between the sexes can be found. Patients typically have unilateral or, less frequently, bilateral epicondylitis when they first present with the condition [4]. Epicondylitis most

frequently affects the dominant arm. Despite the fact that symptoms typically disappear on their own, a small percentage of people may experience them for up to two years [5].
A chronic condition known as extensor carpi radialis brevis damage causes pain over the elbow joint and, in rare cases, restricts movement of the elbow joint, especially when shaking hands or playing professional sports [6]. Tendon tissue breakdown constitutes the pathology. With the development of information technology and electronic products, the disease's age of onset has decreased, its prevalence has risen annually, and its propensity for recurrence has increased in recent years [7]. (8).
The repetitive, powerful usage of the arm in an arc overhead while participating in overhead sports can place a great deal of strain on the shoulder and elbow.28This increases the danger of shoulder and elbow overuse injuries, especially in top young players who are known for their immaturity of the musculoskeletal system, undeveloped motor abilities, nonlinearity of growth, and continued practice of early sports specialization.12
According to earlier research, 17% to 40% of overhead young players reported having a shoulder overuse injury, and 28% reported having nontraumatic elbow pain.1,16,21.(9)
Frequently, tendons and their sheaths sustain overuse damage in the connective soft tissues [4]. According to research, the ideal name to describe tendinous lesions brought on by overuse is tendinopathy [5]. As tendons' reactions to repetitive loading above the physiological limit, tendon degeneration (tendinosis), tendon sheath inflammation (tendinitis), or both, can be observed [6].
Repetitive loading can induce tendon damage even when the load magnitude is within the usual range because the tendon doesn't have enough time to recuperate before the next cycle of loading. It is believed that the primary pathogenic cause of degeneration is excessive loading of tendons during strenuous physical exercise [7].
Repetitive motions, protracted racquet gripping, standards for warm-up and cool-down, muscle-building exercises, intensity of practice (duration, frequency), standards for the equipment (racquet weight, handle size, tension of strings, standards of shuttlecock), duration of playing badminton, and improper technique are a few things that can lead to elbow, wrist, and hand tendinopathies in badminton players. (10).
A common condition affecting the wrist joint is wrist tendonitis, which is characterized by irritation and inflammation of the tendon at the wrist joint. Numerous tendons surround this joint. The fibrous connective tissue known as a tendon is what holds a muscle to a bone and permits joint movement.[5] The forearm muscle and the hand and finger bones are connected by the wrist tendon. They are separated into flexors and extensors. Extensors are the tendons that run along the back of the wrist and cause it to bend inward; flexors run along the front of the wrist and cause it to bend inward.[5] Overuse or repeated motion are the main causes of wrist tendonitis. Repeated wrist movements and similar actions lead to Wrist tendonitis may manifest as pain, edema, and redness.[7] This problem causes cracking noises, thumb catches, and pain that is worse with grabbing or pinching. It is a frequent overuse injury brought on by the inverse energy storage and release with excessive compression.[3] (11)

METHODOLOGY:

Type of study: Cross- sectional survey study
Sampling: Simple Random Sampling
Area of Project: Greater Noida

Sampling Method:

- No of Sample:50
- Sample place: K9 Badminton Academy, Galgotias badminton club.

Inclusion Criteria:

- AGE 18-30 yrs.
- 50 young badminton players

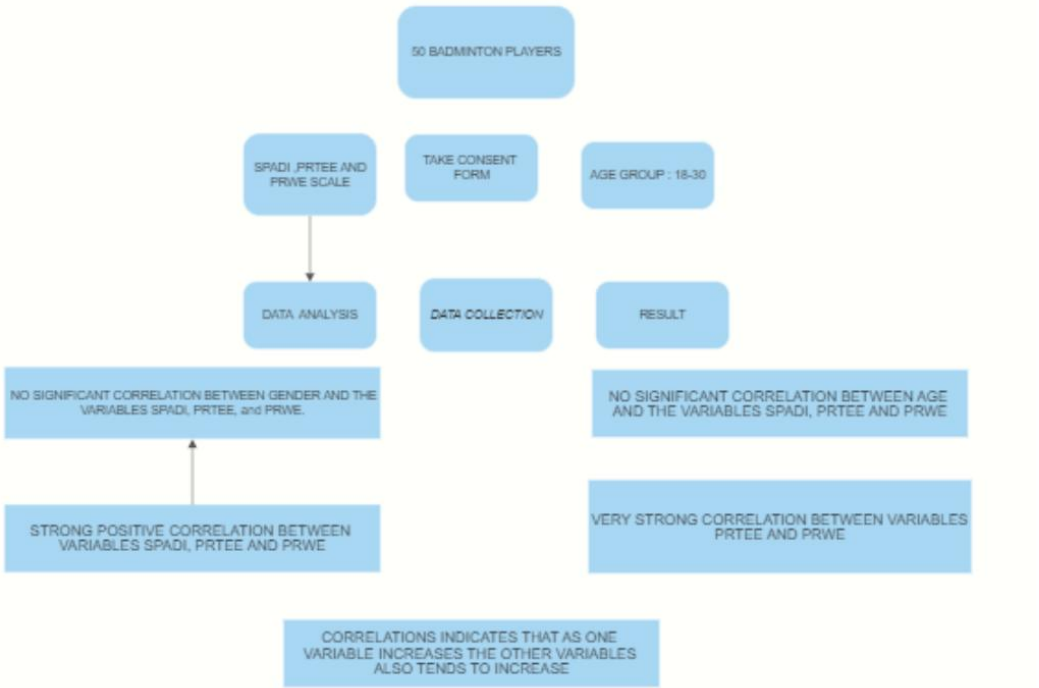
- Patients with shoulder pain, tennis elbow and wrist pain for more than two weeks were included in the study.
- Male and females both are included.
- Only badminton players

Exclusion Criteria:
- Lower limb injuries
- Age less than 18 and more than 30 are excluded.

Instrumentation:
- SPADI
- PRTEE
- PRWE

PROCEDURE:
Through a survey, the prevalence of wrist pain, tennis elbow, and shoulder pain among young badminton players in Greater Noida was examined. Following the application of the inclusion and exclusion criteria, 50 participants will be included in the study. In addition to providing demographic information, such as their name, age, gender, and place of employment, each participant signed the consent form to show their willingness to participate in the study.
The next set of actions were then carried out.
The shoulder pain and disability index (SPADI), patient rated tennis elbow evaluation (PRTEE), and patient rated wrist evaluation (PRWE) will be used to gauge each player's level of pain.
It took roughly two months to collect all the data after the form was distributed starting on May 12, 2023. Chi-square (Microsoft Office Excel) Graphs and Tables were used to analyze the data along with the SPSS 20 Version.

RESULTS:



RESULTS

1.GENDER: The Chi-Square test statistic for GENDER was 0.320 with 1 degree of freedom (df) and a p-value of 0.572. Since the p-value is higher than the significance level, which is usually set at 0.05, the null hypothesis of independence between GENDER and the variables SPADI, PRTEE, and PRWE cannot be disproved.

2. Age: The Chi-Square test statistic for AGE was 24.160 with 8 degrees of freedom (df), and the associated p-value was 0.002. The p-value is below the significance level of 0 point 05, indicating that there is sufficient data to reject the null hypothesis of independence.

3. SPADI: The associated p-value for the Chi-Square test statistic for SPADI was one thousand, and the statistic was 15 point 600 with 40 degrees of freedom (df). The p-value is higher than 0.05, so we don't have enough information to reject the null hypothesis of independence. Accordingly, it is possible that SPADI and the other variables do not significantly correlate.

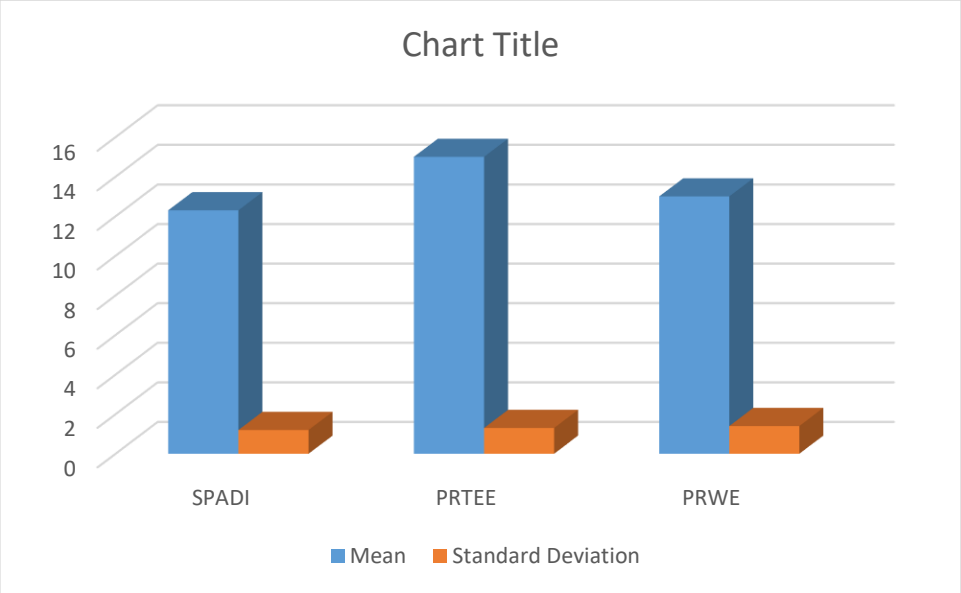
4. PRTEE: The associated p-value for the PRTEE Chi-Square test statistic of 38.920 with 38 degrees of freedom (df) was 0.428. The p-value is greater than 0.05, so there aren't enough facts to support the null hypothesis of independence. This suggests that there is no discernible relationship between PRTEE and the other variables.

5. PRWE: The associated p-value for PRWE's 59.520 with 36 degrees of freedom (df) Chi-Square test statistic was 0.008. The p-value is less than 0.05, indicating that we have enough data to rule out the null hypothesis of independence. It is therefore possible to draw the conclusion that there is a significant relationship between PRWE and the other variables.

6. The Chi-Square Test's findings are listed below.

Variable	Mean	Standard Deviation
SPADI	**12.3000**	**1.2**
PRTEE	**15.0000**	**1.3**
PRWE	**13.0000**	**1.4**

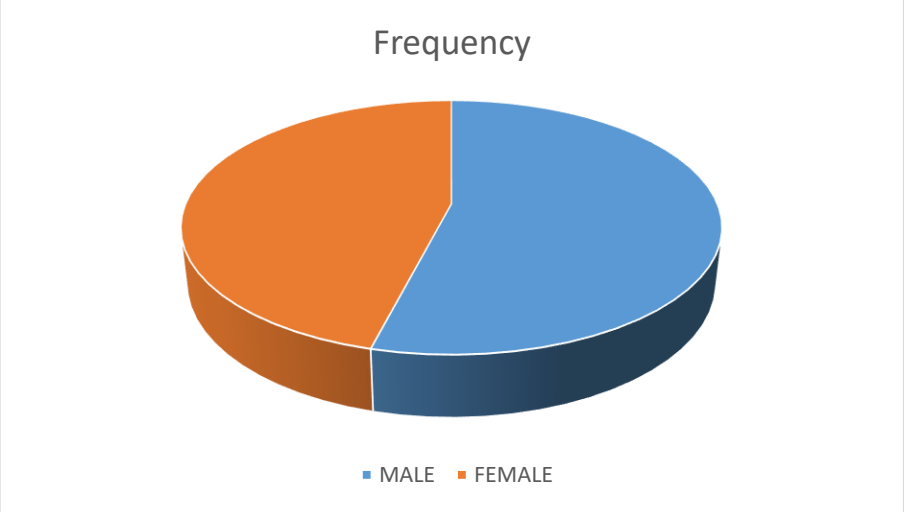
Table 1- descriptive



Graph: 1

Gender	Frequency
0-MALE	27
1-FEMALE	23

Table: 2 Gender Ratio



GRAPH : 2 Chi- square

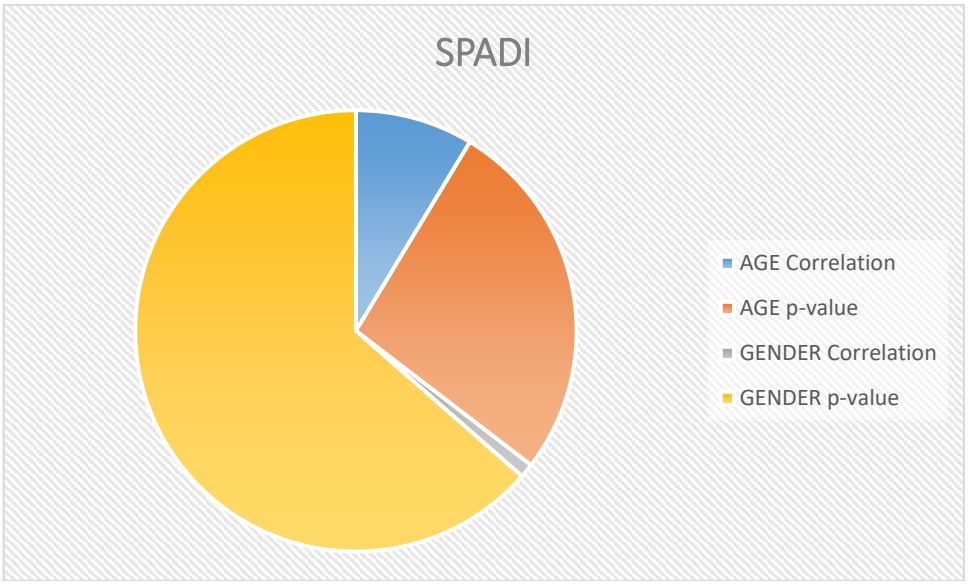
In summary, based on the Chi-Square Test results, we find a significant association between AGE and PRWE, suggesting that the Patient-Rated Wrist Evaluation is related to age. However, there is no significant association between GENDER and the other variables, and also no significant associations between SPADI, PRTEE, and the other variables.

The correlation analysis by for the provided data reveals the following findings:

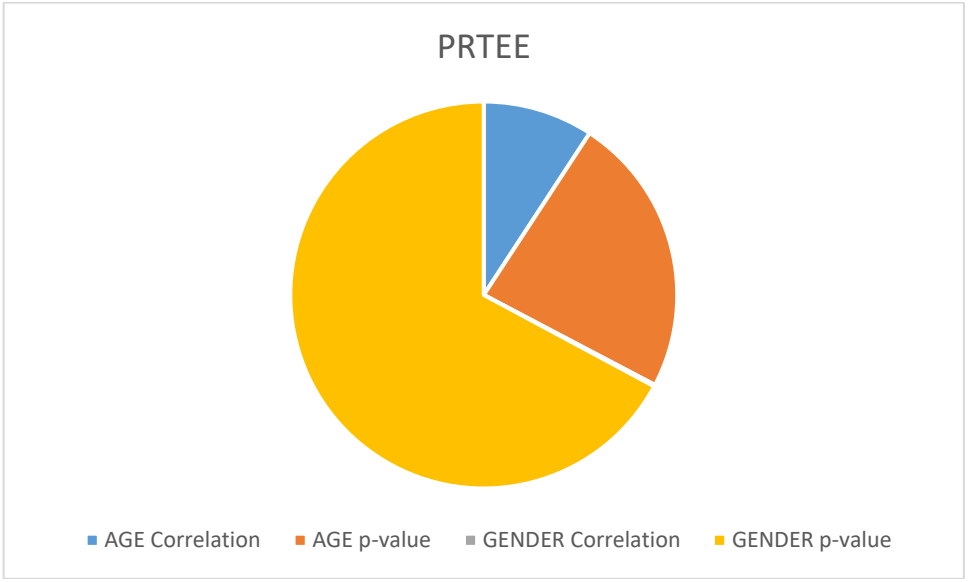
1. GENDER and AGE: There is a very weak negative correlation between GENDER and AGE (Pearson's correlation coefficient = -0.052), but it is not statistically significant ($p = 0.721$).
2. GENDER and SPADI: There is a very weak negative correlation between GENDER and SPADI (Pearson's correlation coefficient = -0.015), and it is not statistically significant ($p = 0.919$).
3. GENDER and PRTEE: There is a negligible positive correlation between GENDER and PRTEE (Pearson's correlation coefficient = 0.002), and it is not statistically significant ($p = 0.990$).
4. GENDER and PRWE: There is a weak negative correlation between GENDER and PRWE (Pearson's correlation coefficient = -0.038), but it is not statistically significant ($p = 0.794$).
5. AGE and SPADI: There is a weak positive correlation between AGE and SPADI (Pearson's correlation coefficient = 0.125), but it is not statistically significant ($p = 0.387$).
6. AGE and PRTEE: There is a weak positive correlation between AGE and PRTEE (Pearson's correlation coefficient = 0.136), but it is not statistically significant ($p = 0.346$).
7. AGE and PRWE: There is a weak positive correlation between AGE and PRWE (Pearson's correlation coefficient = 0.195), but it is not statistically significant ($p = 0.175$).
8. SPADI and PRTEE: There is a strong positive correlation between SPADI and PRTEE (Pearson's correlation coefficient = 0.842), and it is statistically significant at the 0.01 level ($p < 0.01$).
9. SPADI and PRWE: There is a strong positive correlation between SPADI and PRWE (Pearson's correlation coefficient = 0.879), and it is statistically significant at the 0.01 level ($p < 0.01$).
10. PRTEE and PRWE: There is a very strong positive correlation between PRTEE and PRWE (Pearson's correlation coefficient = 0.900), and it is statistically significant at the 0.01 level ($p < 0.01$).

Variable	AGE Correlation	AGE p-value	GENDER Correlation	GENDER p-value
SPADI	0.125	0.387	-0.015	0.919
PRTEE	0.136	0.346	0.002	0.990
PRWE	0.195	0.175	-0.038	0.794

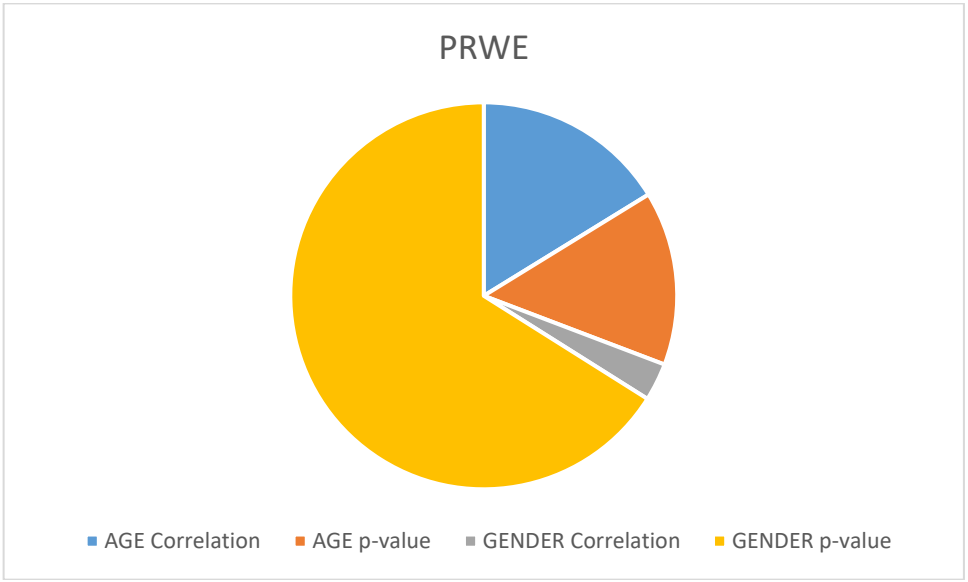
TABLE: 3 CORRELATION BETWEEN AGE AND GENDER



GRAPH: 3 CORRELATION OF SPADI BETWEEN AGE AND GENDER



GRAPH: 4 CORRELATION OF PRTEE BETWEEN AGE AND GENDER



GRAPH: 5 CORRELATION OF PRWE BETWEEN AGE AND GENDER

According to the analysis, GENDER and the variables SPADI, PRTEE, and PRWE do not seem to be significantly correlated. There is no discernible relationship between AGE and the variables SPADI, PRTEE, and PRWE. However, there is a significant positive correlation between the patient-rated wrist evaluation (PRWE), the patient-rated tennis elbow evaluation (PRTEE), and the shoulder pain and disability index (SPADI).

DISCUSSION:

The prevalence of wrist pain, tennis elbow, and shoulder pain among young badminton players in Greater Noida was investigated in this study. According to the analysis's findings, GENDER and the variables SPADI, PRTEE, and PRWE don't appear to be significantly correlated. No significant correlation exists between AGE and the variables SPADI, PRTEE, and PRWE. There are significant positive correlations between the shoulder pain and disability index (SPADI) and the patient-rated tennis elbow evaluation (PRTEE) and patient-rated wrist evaluation (PRWE), respectively. Because of these significant correlations, it is safe to assume that the measurements are connected because when one variable increases, the other usually follows suit.

The results of the study showed the highest prevalence of shoulder pain, tennis elbow, and wrist pain among young badminton players when compared to a similar study on musculo-skeletal disorders among recreational badminton players of districts in Arunachal Pradesh conducted by Racho Kanya1 and Ngilyang Mica. Additionally, it was found that the most common injuries suffered by recreational badminton players were knee, shoulder, low back, and wrist/hand injuries. performed a similar study on common injuries in recreational badminton players, and they came to the conclusion that shoulder and back injuries were the most common injuries suffered by recreational badminton players4.

CONCLUSION

According to this study, there is no discernible relationship between the variables GENDER and SPADI, PRTEE, or PRWE. There is no significant age-related correlation between the variables SPADI, PRTEE, and PRWE. The relationship between PRTEE and PRWE is also very strongly positive. Because of these significant correlations, it is safe to assume that the measurements are connected because when one variable increases, the other usually follows suit.

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