Sports-related concussion history, reporting behaviours, knowledge, and attitudes in Pakistani university student-athletes

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Abstract

Objective: To assess student-athletes' knowledge and attitudes towards sport-related concussions and to investigate concussion history and reporting behaviours.

Method: The cross-sectional, survey-based study was conducted from September 2020 to June 2021 after approval from the research ethics committee of Universiti Malaya, Malaysia, and comprised student-athletes of either gender aged 18 years or above at various universities across Pakistan and who played contact or collision sports for their universities. Data was collected using the Urdu version of the Rosenbaum Concussion Knowledge and Attitudes Survey-Student Version. Data was also gathered about the participants' self-reported exposure to formal concussion education, previous sport-related concussion history, and reporting behaviours, where applicable. Data was analysed using SPSS 23.

Results: Of the 369 participants, 224(60.7%) were males and 145(39.3%) were females. The overall mean age was 19.95±1.75 years. Among the participants, 327(88.6%) had not received formal concussion education. The mean knowledge score was 12.76±2.73 out of a possible 25 points, and the mean attitude score was 38.63±10.30 out of 75 points. Knowledge had a weak positive correlation with attitude towards sport-related concussions SRC ($p<0.05$). Females displayed better attitudes towards sport-related concussions than their male counterparts ($p<0.05$). Overall, 126(34%) participants had experienced sport-related concussion symptoms following a blow to the head in the preceding 12 months, and 81(64.3%) of them had continued playing while being symptomatic.

Conclusion: Pakistani university student-athletes lacked adequate concussion knowledge and held poor attitudes towards sport-related concussions.

Key Words: Brain concussions, Brain injuries, Traumatic, Athletes, Incidence.

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Introduction

Sports-related concussions (SRCs) are among the most frequent sports-related injuries and have been recognised as a significant public health concern.[1,2] Each year, up to 3.8 million SRCs occur in the United States alone.[3] Collision or contact sports expose athletes to situations where they may sustain an SRC. Although most athletes fully recover within 7-10 days of experiencing an SRC, some experience adverse neurological effects that remain throughout their lifespans.[3] A return to play (RTP) while experiencing SRC symptoms increases the risk of additional complications.[1,4] A second impact while being symptomatic can result in exacerbated neurological effects, intracerebral haemorrhage, cerebral oedema, or even death.[5] Multiple individual SRCs may result in chronic traumatic encephalopathy (CTE).[1,3] CTE has long-term repercussions on cognitive functions, including decreased attention span, memory and focus, potentially leading to confusion, disorientation, and, in some cases, suicidal tendencies. SRCs have also been linked to health-related quality of life (HRQOL) impairments, dementia, and depression.[6]

Several sports have modified their safety rules to help keep athletes safe from the negative impacts of SRCs.[2,7] However, preventing SRCs in contact or collision sports is not easy.[3] Hence, timely identification and appropriate medical attention are crucial. Current recommendations from organisations, such as the Concussion in Sport Group, are to immediately remove a player who has sustained a potentially concussive impact and only allow them RTP after proper medical evaluation.[1-3] However, SRC is often considered an "invisible injury". Although a few of its symptoms, such as loss of consciousness and vomiting, are easily noticeable, several others, such as headaches or dizziness, are challenging to observe. Hence, many concussions go unnoticed, and medical professionals rely on the athletes to report potential symptoms.[1]

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For athletes to report a concussion, they must be able to recognise a potential concussion and believe that reporting is in their best interests.[2,8] Educating athletes about concussions is now considered a priority.[2] In the US, all states have passed legislation aimed at educating athletes about concussions and their complications. Similarly, all major sporting organisations have protocols to educate athletes about SRCs.[7] Researchers have also advocated that concussion education programmes should use existing psychosocial theories of health behaviour to influence athletes' reporting behaviours.[8-10]

SRCs are common sport injuries that affect more than 10% of athletes participating in collision or contact sports each season worldwide, and their incidence is on the rise.[1,11] In Pakistan, contact or collision sports with high rates of concussions, such as football (soccer) and field hockey, are popular among youth.[12] A high incidence of concussions has also been reported for kabaddi,[13] a traditional subcontinental sport. Rugby, a sport with the highest rate of SRCs,[14] is also gaining popularity in Pakistan. Cricket, the most popular sport in Pakistan, has also been linked to SRC cases.[15] Voss et al.[16] reported that the SRC rate in Pakistan is low, but studies of neurotrauma in Pakistan have identified numerous SRC cases.[17,18] Researchers have suggested that the actual number of SRCs may be higher in Pakistan, but underreporting by athletes is high.[12,19] Underreporting could arise due to a lack of knowledge among athletes about the potential consequences of head injury and failure to recognise concussion signs and symptoms or poor reporting behaviours.[1,19]

Investigating athletes' knowledge and attitudes about concussions — particularly at the university level — is critical because the risk of SRCs has been reported to be higher at university or collegiate levels compared to lower levels of competition.[4,20] Moreover, researchers have claimed that university student-athletes are less likely to disclose concussion symptoms than athletes at other levels.[8,21,22] Another element of interest is the gender difference in athletes' attitude towards SRC and reporting behaviours.[23] Additionally, exploring the correlation between SRC knowledge and attitudes is crucial for designing effective interventions.[9,22]

Despite a thorough literature review, no study could be found on SRC knowledge and attitudes — or incidence of SRCs — among athletes in Pakistan. The current study was planned to fill the gap by investigating SRC-related knowledge, attitudes, and reporting behaviours among university student-athletes in Pakistan.

Subjects and Methods

The cross-sectional, survey-based study was conducted from September 2020 to June 2021 after approval from the research ethics committee of Universiti Malaya, Malaysia, and comprised student-athletes of either gender aged 18 years or above at various universities across Pakistan and who played contact or collision sports for their universities. Student-athletes under the age of 18, as well as those involved in non-contact or non-collision sports, or who did not agree to participate in the study, were excluded. Participants were recruited using purposive sampling strategies. The sample size was calculated using an online calculator,[24] with 1.96 million university students in Pakistan,[25] at 95% confidence interval (CI), and 5% margin of error.

Data was collected after obtaining informed consent from the participants, permission from the relevant officials at each university, and permission from the authors of the data-collection tools.[9,26] The athletes were approached during visits to their respective universities.

The Rosenbaum Concussion Knowledge and Attitudes Survey–Student Version (RoCKAS-ST)[26] has undergone extensive psychometric evaluation and has been recognised as a valid and reliable tool. It consists of 55 items divided into three subscales: Concussion Knowledge Index (CKI), Concussion Attitude Index (CAI), and the Validity Index (VI). The CKI, which measures concussion knowledge, comprises three subsections with a total of 25 dichotomous (True/False) items. Dichotomous items are commonly used in knowledge quizzes to assess existing knowledge or knowledge gaps because they help reduce respondents' boredom and fatigue. However, they are also known for certain drawbacks, such as oversimplification of complex concepts and the possibility of respondents guessing the correct answer. Nevertheless, researchers frequently employ them as they are user-friendly and time-efficient. Each correct response to a CKI item is scored as 1, resulting in a maximum score of 25 points, with higher scores reflecting greater concussion knowledge. The CAI, which measures attitudes towards concussion, consists of 15 questions answered on a 5-point Likert scale ranging from strongly agree to strongly disagree. Answers reflecting safer attitudes towards concussions are scored as 4-5 points, while unsafe responses receive 1-2 points, resulting in a maximum score of 75 points, with a higher score reflecting safer attitudes towards concussions. Likert scales are widely employed in survey research due to their ease of construction, administration, and analysis. However, they are prone to response bias and social desirability. Despite these limitations, researchers

commonly use Likert scales as reliable tools to assess levels of agreement or feelings towards a particular subject. The VI consists of 3 questions to confirm internal validity: fewer than two correct responses result in disqualification.

The current study used the reliable and validated Urdu version of RoCKAS-ST.[27] Also used was a tool developed by Kroshus et al.[9] The participants reported (yes/no) if they ever received a knock to the head, face or neck while playing their sport. In addition, the participants indicated (yes/no) if they experienced any sensory, somatic or cognitive symptom(s) of SRC following an impact within the preceding 12 months. Participants' history of reporting SRCs was assessed using two dichotomised items, asking if they reported the symptoms to a coach or medical professional immediately or the next day. These items were scored as 0 or 1, with 1 indicating that the SRC was reported. Participants also provided their demographic variables (age, gender), main sport, current competition level, years playing their main sport, and previous exposure to concussion education (yes/no).

Data was analysed using SPSS 23. Athletes' knowledge and attitude scores were analysed using descriptive statistics, such as mean ± standard deviations or frequencies and percentages. Correlations between the CKI and CAI total scores were assessed using Spearman's rank correlation due to data non-normality. Mann-Whitney U test was used to assess differences in attitude scores between male and female participants. Chi-square test of independence was used to examine gender differences in reporting past SRCs. $P < 0.05$ was considered statistically significant.

Results

Out of 450 individuals approached, 400(88.8%) returned the questionnaires, but 31(7.75%) questionnaires were excluded as they had not been filled completely. The final sample, as such, had 369(92.2%) participants; 224(60.7%) males and 145(39.3%) females. The overall mean age was 19.95±1.75 years, and the mean playing experience was 5.11±2.30 years. Among the participants, 327(88.6%) had not received formal concussion education. Football was the most common sport played by 156(42.3%) subjects, and 7(1.9%) subjects had international exposure (Table 1).

Overall, 222(60.2%) participants reported having received a knock to the head, face or neck, while 126(34.1%) reported experiencing at least one concussion symptom after receiving a knock in the preceding 12 months. Participants who reported a knock in the preceding 12 months experienced an average of 3.14±1.49 SRC symptoms. Among the possible SRC symptoms,

Table-1: Main sports by gender and current participation level (n = 369).

Demographics	Total		Male		Female	
	n	%	*n*	%	*n*	%
Sports Played						
Football	156	42.3	97	62.2	59	37.8
Hockey	49	13.3	17	34.7	32	65.3
Boxing	12	3.3	9	75.0	3	25.0
Martial Arts	36	9.8	10	27.8	26	72.2
Kabaddi	24	6.5	24	100	Nil	Nil
Basketball	38	10.3	13	34.2	25	65.8
Rugby	31	8.4	31	100	Nil	Nil
Handball	23	6.2	23	100	Nil	Nil
Total	369		224	60.7	145	39.3
Level of Participation						
International Level	7	1.9	3	42.9	4	57.1
National Level	29	7.9	18	62.1	11	37.9
Department Level	35	9.5	13	37.1	22	62.9
University Level	237	64.2	159	67.1	78	32.1
Club Level	61	16.5	31	50.8	30	42.9
Total	369		224	60.7	145	39.3

93(73.8%) subjects reported dizziness, and 83(65.9%) reported headaches after a knock. Other symptoms, such as bell rung, amnesia, concentration problems, nausea, and seeing stars, were reported by 48(38.1%), 46(36.5%), 41(32.5%), 35(27.8%) and 33(26.2%) participants, respectively. Only 15(11.9%) participants reported loss of consciousness. Of these 126(34.1%) participants, 81(64.3%) did not report the symptoms and continued playing, while 88(70.4%) continued experiencing symptoms the next day but did not report them to their coaches or medical staff.

The mean knowledge score was 12.76±2.73 (range: 6-20; 95% CI: 12.49-13.05) (Table 2).

The mean attitude score was 38.63±10.30 (range: 19-66; 95% CI: 37.58-39.69). Overall, 229(62.1%) participants said it is players' responsibility to return to a game even if they are still experiencing SRC symptoms, and 298(81.6%) felt that players should return to an important game even if they had concussion symptoms (Table 3).

There was a weak but significant positive correlation between CKI and CAI scores, indicating that an increase in knowledge is likely to positively affect safer attitudes towards SRCs (Table 4).

Female participants had a significantly better attitude towards SRCs ($p < 0.05$), but previous SRC reporting patterns did not differ significantly between the genders (Table 5).

Table-2: Concussion knowledge scores.

Concussion Knowledge Index		Correct Response	Answered Correctly	%
Section 1				
1.There is a possible risk of death if a second concussion occurs before the first one has healed.		True	150	40.7
2.People who have had one concussion are more likely to have another concussion.		True	208	56.4
3.In order to be diagnosed with a concussion, you have to be knocked out.		False	117	31.7
4.A concussion can only occur if there is a direct hit to the head.		False	153	41.5
5.Being knocked unconscious always causes permanent damage to the brain.		False	213	57.7
6.Symptoms of a concussion can last for several weeks.		True	248	67.2
7.Sometimes a second concussion can help a person remember things that were forgotten after the first concussion.		False	94	25.5
8.After a concussion occurs, brain imaging (e.g., CAT Scan, MRI, X-Ray, etc.) typically shows visible physical damage (e.g., bruise, blood clot) to the brain.		False	80	21.7
9.If you receive one concussion and you have never had a concussion before, you will become less intelligent.		False	220	59.6
10.After 10 days, symptoms of a concussion are usually completely gone.		True	229	62.1
11.After a concussion, people can forget who they are and not recognize others but be perfect in every other way.		False	218	59.1
12.Concussions can sometimes lead to emotional disruptions.		True	251	68.0
13.An athlete who gets knocked out after getting a concussion is experiencing a coma	.	True	220	59.6
14.There is rarely a risk to long-term health and well-being from multiple concussions.		False	148	40.1
Section 2				
15.It is likely that Player Q's concussion will affect his long-term health and well-being.		False	198	53.7
16.It is likely that Player X's concussion will affect his long-term health and well-being.		True	149	40.4
17.Even though Player F is still experiencing the effects of the concussion, her performance will be the same as it would be had she not suffered a concussion.		False	232	62.9

Table-3: Concussion attitude scores.

Concussion Attitude Index		Safer Response	Correct Responses	%
Personal Return to Play Attitudes				
1.I would continue playing a sport while also having a headache that resulted from a minor concussion	.	SD/D	106	28.7
2.I feel that an athlete has a responsibility to return to a game even if it means playing while still experiencing symptoms of a concussion.		SD/D	108	29.3
3.I feel that Athlete M should have returned to play during the first game of the season.		SD/D	95	25.7
4.I feel that Athlete O should have returned to play during the semifinal playoff game	.	SD/D	61	16.6
Views about Others' Return to Play Attitudes				
1.Most athletes would feel that Coach A made the right decision to keep Player R out of the game.		SA/A	68	18.4
2.Most athletes would feel that athlete M should have returned to play during the first game of the season.		SD/D	62	16.8
3.Most athletes feel that Athlete O should have returned to play during the semifinal playoff game.		SD/D	48	13.0
4.Most athletes would feel that Athlete H should tell his coach about the symptoms.		SA/A	65	17.7
Views about Coaches' Concussion Management & Precautions				
1.I feel that an athlete who is knocked unconscious should be taken to the emergency room.		SA/A	236	64.0
2.I feel that coaches need to be extremely cautious when determining whether an athlete should return to play.		SA/A	253	68.6
3.I feel that Coach A made the right decision to keep Player R out of the game.		SA/A	236	64.0
Views about Physiotherapists' Concussion Management				
1.I feel that the physiotherapist, rather than Athlete R, should make the decision about returning Athlete R to play.		SA/A	117	31.7
2.Most athletes would feel that the physiotherapist, rather than Athlete R, should make the decision about returning Athlete R to play.		SA/A	68	18.4
General Attitude Towards Concussion				
1.I feel that concussions are less important than other injuries.		SD/D	181	49.0
2.I feel that Athlete H should tell his coach about the symptoms.		SA/A	90	24.3

SA/A: Strongly agree/agree, SD/D: Strongly disagree/disagree.

Table-4: Correlation between concussion knowledge and attitude.

Attitude	Knowledge	95% confidence interval	P
p < .05	0.109	0.01-.22	0.03*

Discussion

The current study investigated SRC-related knowledge and attitudes of university student-athletes in Pakistan. Previous studies have found the risk of SRCs to be higher at the post-secondary level.[4,20] Thus, it is imperative that university student-athletes are aware of concussion

Table-5: SRC reporting pattern and its correlation with gender.

	Total	Male (n = 224)		Female (n = 145)				
		Mean	SD	Mean	SD	U	Z/X^2	p
Attitudes	369	36.98	9.78	41.19	10.59	12638.50	-3.60‡	0.000*
SRC Reporting	126	–	–	–	–	–	2.79†	0.09

SRC: Sport-related concussion. * Significant, ‡Mann-Whitney U test, †Chi-square test.

symptoms and complications. However, the current sample's average concussion knowledge was inadequate, and many misunderstandings were observed. Specifically, more than half of the participants believed that an athlete must lose consciousness to be diagnosed with an SRC. Furthermore, over half of the participants assumed that SRC could occur only after a direct hit to the head. More than 55% of the participants were unaware that an additional SRC could cause death. Athletes must be aware of SRC symptoms so they may identify and inform medical professionals.[2,8] However, only headache was successfully identified as a valid concussion symptom by majority of the current participants. The fact that 88.6% of participants reported no formal concussion education might explain the low concussion knowledge scores.

Besides awareness of concussion symptoms, athletes should believe that reporting SRC symptoms and following the RTP protocols are in their own best interest.[9,23] The participants generally showed unsafe attitudes towards concussion symptom disclosure and RTP, with 65.1% indicating that they would continue playing despite having a headache from a concussion and 73.7% saying that players should hide their concussion symptoms if they thought that the coach might exclude them from the match.

Individual attitudes play a significant role in shaping a specific behaviour. Previous studies on SRC nondisclosure in other countries have suggested that personal attitudes, like the desire to succeed, the significance of the match, not wanting to leave a game, and not wanting to let teammates down, play a significant role in SRC reporting behaviours.[23,28] Additionally, factors such as athletic identity, sports culture, coaches' attitudes towards injury reporting, and insufficient knowledge can also impact SRC reporting behaviours.[10,23] However, no published studies could be found that explored the factors influencing the attitudes and reporting behaviours of Pakistani athletes regarding SRCs. Therefore, it is recommended that qualitative research be conducted to explore the underlying causes of poor attitudes towards SRC reporting among Pakistani student-athletes.

The current participants' beliefs about other athletes' attitudes towards concussion management and RTP were particularly alarming. The vast majority (81.6%) of the participants stated that most athletes would feel that a player who experiences SRC symptoms should return to an important match. Furthermore, 79.9% subjects believed other athletes would hide their symptoms from coaches to play a game. Researchers have suggested that social norms and perceived team reporting norms influence athletes' SRC reporting behaviours.[21,23] Thus, concussion education interventions should include teammates and role models, and focus on cultivating intra-team communication about concussion safety.

Views about physiotherapists' concussion management were also concerning. Most participants indicated that athletes, not physiotherapists, should decide about RTP after a concussion. The unavailability of medical assistance in Pakistani sports fields[12] may explain these views. Encouragingly, the participants reported positive attitudes towards coaches' concussion management, with 68.6% believing that a coach needs to be extremely careful when determining an athlete's RTP, and 64% agreeing with a coach's decision to remove an athlete from a game after a concussion. Despite agreeing that playing with a concussion would negatively affect performance, 75.6% subjects felt that athletes should not report symptoms to their coaches to avoid being sidelined. The desire to avoid "letting the team down" or "losing the spot on the team" may help explain this finding.[23,28] Thus, concussion education programmes may highlight the impact of playing while being symptomatic on individual and team performance to improve SRC reporting.

Overall, female participants showed significantly better attitudes towards reporting SRCs than males in the current study. Past studies have suggested that female athletes tend to have better intentions towards SRC reporting than male athletes.[23] Interestingly, no difference was observed between male and female participants' previous reporting of SRC symptoms. Researchers have proposed that male and female athletes conform to traditional masculine norms of risk-taking, avoiding help-seeking, and winning at all costs.[8] Thus, concussion interventions are encouraged to focus on improving sports ethos rather than gender differences.

Voss et al.[16] reported low SRC rates in Pakistan. However, 126(34.1%) participants reported experiencing at least one SRC symptom after receiving a knock to the head, face or neck in the preceding 12 months in the current study. The findings are congruent with Pakistani neurotrauma studies, which recorded multiple SRCs nationally.[17] Notably, 64.3% of the concussed athletes in the current study did not report their symptoms to their coaches, which is consistent with the claims that most SRCs are not reported in Pakistan.[12,19]

Prior studies have found that athletes who received formal concussion education reported a better understanding of and attitudes towards concussions.[1] However, 88.6% of the current participants had not undergone any formal concussion education. Therefore, the government, educational institutions, and sporting bodies should mandate and organise formal concussion education programmes for athletes.

The coaches' role becomes critical in identifying and managing concussive events, given that medical assistance is not readily available on playing fields in Pakistan.[12] Furthermore, coaches' positive attitudes towards injury reporting influence athletes' attitudes towards concussion reporting.[8,10,23] Indeed, the current participants demonstrated positive attitudes towards concussion management by coaches. Therefore, university coaches should be included in concussion education programmes. Similarly, match officials at university sporting events should be educated on SRCs to ensure timely identification of concussive incidents and withdrawal of concussed athletes from play.

Studies have also called for SRC education to focus on changing behaviours regarding SRC reporting.[10] Some researchers have claimed that personal attitudes and social norms drive SRC reporting behaviours more than SRC knowledge.[10,23] In the current study, concussion knowledge was weakly correlated with attitudes towards concussions. Thus, delivering concussion education without targeting the factors associated with concussion reporting is not recommended. Instead, theory-based concussion education programmes targeting behavioural constructs are recommended.[8,9,23]

The current study contributes significantly to the under-researched field of SRCs in Pakistan by identifying the knowledge gaps among athletes. Considering the popularity of contact and collision sports in Pakistan, along with the cultural norms that encourage pain tolerance, the findings provide valuable insights into athletes' SRC reporting and RTP attitudes. Additionally, the study sheds light on athletes' views concerning influential individuals, such as teammates, coaches and physiotherapists, who may influence SRC reporting. Understanding these dynamics will aid in the development of effective implementation strategies for future SRC interventions and national policies. Future studies should focus on exploring barriers and facilitators to reporting SRCs, with the aim of incorporating these factors into contextually appropriate SRC awareness programmes.

The current study, however, has some limitations. First, in Islamic countries, like Pakistan, sports participation among females is generally lower than among males; thus, 60.7% of the study participants were males, skewing the data. Second, previous concussion incidents, symptoms and reporting history were self-reported by the participants based on memory recall. As such, the accuracy of the data cannot be validated. Future studies could triangulate memory recall and injury surveillance to address this limitation.

Conclusion

Pakistani university student-athletes were found to have received no formal SRC education and, as such, lacked adequate concussion knowledge. They held poor attitudes towards SRCs. The tendency to play while symptomatic and failure to report symptoms are of considerable concern. There is an urgent need for targetted programmes to enhance SRC knowledge and improve reporting behaviours. Evidence-based concussion awareness interventions grounded in behavioural change theories should be initiated to promote understanding, reporting, and appropriate management of SRCs.

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Author's Contributions
MM: Conceived the idea, writing, collecting and analyzing the data
YN: Conceived the idea, verified the results, and edited the manuscript.
ET: Supervised the project and helped write, edit, revise and verify the results.
ZS: Helped with revising, proofreading, data collection and analysis.
All authors consulted for collecting and analysing the data, contributed to the article and approved the final version.