Epidemiology of Sports-related Musculoskeletal Injuries Common in Men's Domestic Cricket: An Analytical Cross-sectional Study Based on Sports Fields

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a Research work developed Institution: State College of Health Science (SCHS), Dhaka, Bangladesh

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Submitted: 2020-09-02; **Accepted**: 2020-12-08;**Doi:**https://doi.org/10.22037/jcpr.v6i1.33304

Abstract

Introduction: Despite gaining the popularity of cricket in Bangladesh, raising the competition frequency causes more injury to the athletes. Even after that, they have yet to develop an injury incidence surveillance system. The aim of this study was to determine the incidence of musculoskeletal injuries and related risk factors that elite domestic cricketer sustains during the game. **Methods and Materials:** A cross-sectional study was conducted in Dhaka, Bangladesh. A total of 198 cricketers with age 15-35 years were purposively adopted for an interview played at least three sessions for the divisional clubs. Participants completed a self-reported questionnaire probing the incidence of injury and risk factors. Binary regression analysis was performed to investigate the correlation of strain injury with other characteristics. **Results:** Participants had the highest sustained 42.4% strain injury. A rate of 42.9% (P=0.00) was reported for risk factors of strain injury in running but excluding body mass index and ground condition initially. There were no significant differences in strain incidence based on the match, protective equipment, and playing position. Age (odd ration (OR): 0.877, 95% confidence interval(CI): 0.441-1.743), body mass index (OR: 0.268, 95% CI: 0.037-1.960), batsman (OR: 0.376, 95% CI: 0.183-0.770), upper extremity (OR: 6.428, 95% CI: 1.483-27.861) and hard ground (OR: 0.005, 95% CI: 0.001-0.022) were identified as the major risk factors, and the PRICE protocol was proved to be the best physical therapy method to remain in the game. **Conclusion:** In matches, the batsman is most likely to sustain a strain injury mostly to the upper limb. There is no enough evidence to conclude that the injury monitoring system plays a big role, and therefore more study is much needed in cricket.

Keywords: Cricket Sport; Cross-sectional Study; Epidemiological Monitoring; Strain; Physiotherapy

Please cite this paper as: Hoque MF, Khan AR, Khan MJ. Epidemiology of Sports-related Musculoskeletal Injuries Common in Men's Domestic Cricket: An Analytical Cross-sectional Study Based on Sports Fields. J Clin Physio Res. 2021; 6(1): e29.Doi: https://doi.org/10.22037/jcpr.v6i1.32582

Introduction

In 1751, Prince of Wales was knocked down by a cricket ball and died. Since then, the history of cricket injuries has been recorded (1). Although a long period of time has passed since then, the pace of the game, the danger of the sport, and the players' expectations have soared (2), However, . In the following year, it was initially proclaimed by vanMechelen *et al.* (3). In the same year, Robertson published a translation of a standard public health prevention model for sports injuries (4), but even so, the research work has not actually begun.

Long later, a bunch of investigations was published with the varying definition and analysis (5, 6) from South Africa (7), Australia (8, 9), England (6), New Zealand (10) and West Indies (11) before signing a consensus for injury surveillance method within six test-playing nations in 2005 (12).However, in other countries, Bangladeshi cricketers were not subject to such surveillance. So far, Bangladesh has had no injury monitoring methods that could help to take preventive measures.

The real scenario of the injury incidence documented the highest average rate of seasonal injury matches for one day were 39/10 000 player hours, while in the first class there were 27/10 000 player hours among the Australian state and national cricketers (8). A study found that the incidence of injury among provincial cricketers in South Africa was relatively low at 30/10 000 hours (7), but it was not far below that of provincial cricketers in West India (14/10 000 hours) (11).

Table 1.Distribution of the respondents according to the base line characteristics

Variable	Characteristics	Number (%)	Strain		F-test	*P*-value
			Yes	No		
Age (years)	15-21	78(39.4)	71	7		
	22-28	113(57.1)	108	5		
	29-35	7(3.5)	6	1		
Body Mass Index(Kg/m²)	<18.5				0.24	0.13
	18.5-24.9	194 (98)	182	12		
	25 – 29.9	4 (2)	3	1		
	30-34.9					
NutritionalStatus	Very good	11(5.5)	11	0		
	Good	186(93.9)	173	13		
	Poor	1(0.5)	1	0		
CompetitionLevel	1st division	101(51)	95	6		
	2nd division	40(20.2)	40	0		
	3rd division	57(28.8)	50	7		
Playing position	Right hand Batsman	51(25.8)	46	5		
	Left hand Batsman	26(13.1)	22	4		
	Left hand Baller	1(0.5)	1	0		
	Wicket keeper	7(3.5)	4	3		
	All rounder	113(57.1)	112	1		
Ground Condition	Normal	177(89.4)	165	12	1.0	0.72
	Hard	21(10.6)	20	1		
Weather	Vary hot	4(2)	4	0		
	Hot	157(79.3)	150	7		
	Normal	37(18.7)	31	6		
Fitness Training	Intensive	197(99.5)	184	13	1.00	0.79
	Moderate	1(0.5)	1	0		

From the literature review, it could be simply recognized that cricketers were more likely to suffer a high risk of musculoskeletal injury. Among leading players, there was little evidence of injury epidemiology. Therefore, the purpose of this study was to investigate the risk factors associated with the common sports injuries of cricket players and take effective preventive measures as much as possible.

Methods and Materials

Ethics statement

After being accepted by the physical therapy department, the permission was approved (SCHS/BSPT/UG01-10-06-018) by the ethics committee of the State College of Health Sciences (SCHS) in Dhaka, Bangladesh. All ethical issues of research involving human subjects related to the guidelines of the Bangladesh Medical Research Council (BMRC) and the World Health Organization (WHO) Ethics Review Committee were resolved. Before collecting the data, we obtained the written informed consent from each participant and explained the purpose of the study in an easy-to-understand language. Therefore, the ethics documents and all questionnaires were translated from English to Bengali. Each participant had the right to withdraw from the study unconditionally.

Study participants

This prospective descriptive cross-sectional study was conducted within six months from September 2011 to February 2012. The study was led on male cricket players aged 15-35 years who participated in professional leagues for at least three sessions in different sports clubs in Dhaka city and competed for the first, second, or third division titles.

Sample size determination

Since there was no data on the prevalence of musculoskeletal injuries among Bangladeshi cricketers, therefore, we counted the average injury prevalence rate of Australian domestic cricket by8.1% (8). The sample size was calculated by assuming prevalence (P) 8.1% of the outcome variable, where the absolute precision was calculated as 5% (use: confidence interval (CI):5%, Z=1.96 critical value).

Then, those were applied a single proportion formula:

N=z2pq/d2. So, sample size (n)=(1.96)2 (0.081) (1-0.081)/ (0.05)2, n=115 respondents. Here, by assuming that 10% of them were non-response rate, (n)=127.

Participants' selection

The data accumulated by the researchers themselves and the data collection of this study involved a continuous process to maintain reliability. Among the calculated sample, around 200

Table 2.Injury related information and body parts involvement amongst the cricketer (**P*<0.05)

Variable	Characteristics	Number (%)	Strain		x^2	P-Value
			Yes	No		
Occurrence	<7 days	43(21.7)	40	3	6.89	0.07
	>7days	77(38.9)	68	9		
	2 – 4 weeks	67(33.8)	66	1		
	>4 weeks	11(5.6)	11	0		
Incidence	Match	190(96)	177	13	0.58	0.74
	Warm up	4(2)	4	0		
	Training	4(2)	4	0		
Nature of Injury	Pain	71(35.8)				
	Soreness	1(0.5)				
	Contusion	31(15.7)				
	Strain	84(42.4)				
	Fracture	7(3.6)				
	Dislocation	4(2)				
Protective Equipment	Yes	190(96)	171	13	0.59	0.44
	No	8(4)	8	0		
Time	During balling	55(27.8)	43	12	30.01	0.00*
	Collision	13(6.6)	12	1		
	Running	87(42.9)	87	0		
	Due to slip	10(5.1)	10	0		
	Other	5(2.5)	5	0		
Place	Sports ground	197(99.5)	184	13	0.71	0.79
	Gymnasium	1(0.5)	0	1		
Severity	Unable to playing	159(80.3)	148	11	0.30	0.86
	Play after treatment	36(18.2)	34	2		
	Play without treatment	3(1.5)	3	0		
Head and Neck	Head	3(1.5)	1	2	18.71	0.00*
	Neck	5(2.5)	5	0		
	Face	9(4.5)	9	0		
Upper limb and Trunk	Shoulder	39(19.7)	38	1	57.96	0.00*
	Elbow	5(2.5)	5	0		
	Wrist	7(3.5)	7	0		
	Finger	23(11.6)	13	10		
	Trunk	12(6.1)	12	0		
Lower limb	Knee	19(9.6)	19	0		
	Ankle	12(6.1)	12	0		
	Foot	5(2.5)	4	1		
	Quadriceps	10(5)	10	0		
	Hamstrings	27(13.6)	27	0		
	Calf	9(4.5)	9	0		
	Lower back	22(11.1)	22	0		

were recruited from divisional clubs in order to draw a much accurate scenario about musculoskeletal injury-related information following the purposive sampling technique. Recruited sports professionals were invited to participate in face-to-face interviews and organized a structured questionnaire designed to collect information related to musculoskeletal injury prepared in advance and evaluated by researchers. However, participants with strain injury took place outside the sports field beyond the warm-up, practice session, training and/or sporting events that remain excluded from the study. Extensive inspection revealed two uncompleted questionnaires, so the final acceptance date was 198.

Questionnaire

The researcher created a questionnaire that included three parts: The first part contained the basic conditions of athletes, including age, body parts, body mass index (BMI), nutritional status, competition level, weather, and fitness status; the second part introduced the suffering information on the nature of any disability or injury, use the chart to indicate the exact injured part of the body, and the recommended referral system; and the use of

Table 3.Treatment seeking behavior of the cricket players (**P*<0.05)

Variables	Characteristics	Number (%)	Strain		x^2	P-value
			Yes	No		
Referral	None	69 (34.8)	31	38	3.15	0.20
	Physiotherapy	127 (64.1)	51	76		
	Medical	2 (1)	2	0		
Physiotherapy	Rest	178 (89.9)	79	99	55.83	0.00*
	Ice	125 (63.1)	74	51		
	Splint	1 (0.5)	1	0		
	Elevation	3 (1.5)	3	0		
	Stretching	44 (22)	2	42		
	Bandaging	1 (0.5)	1	0		

historical records of treatment method, especially to whom it is referred and what kind of treatment was received as described in the third part.

Data quality control and statistical calculation

All collected questionnaires were coded and checked for correctness, completeness, and internal consistency. Eliminated missing and inconsistent data, these questionnaires were discarded, and the corrected data were entered into the IBM Social Science Statistics Software Package (SPSS-23). Fisher's exact test was carried out and the p-value was proposed at <0.05 to identify the risk factors from the baseline, the nature of the injury, and the behavior of seeking treatment. In order to determine the correlation between these variables and strain injury as the dependent variable, a binary regression analysis was performed, and the odds ratio (OR) and 95% CI were used to illustrate.

Result

Each cricketer was considered as per their primary skill. Of the 198 cricketers, a total of 101 regularly participated in the first-class competition, of which greater than two-quarter (57.3%) were between 22-28 years of age and almost all (98%) of their body mass index was insisting normal score as for good dietary intake (93.9%). Among the participants, more than two-fourth of the players were an all-rounder (57.1%), followed by the batsman 38.9% (right hand: 25.8%, left hand: 13.1%) and this playing position was liable for an injury (p=0.000). They also needed to improve their physical fitness because they had to play in various sports fields (hard 10.6) and different weather conditions (hot 97.3%, very hot 2%) are documented in Table 1.

Table 2 reported the injury preliminary on the basis of the game position and its injury mechanism. In particular, the incidence of the muscle injury experienced was 94.4% higher than 5.6% of non-muscle injury (dislocation 2%, fracture 3.6%). Among the injuries that occurred, we found a significant relationship between injuries and injury-related characteristics; in the competition, the majority 42.9% (*P*=0.000) reported during running and the leading body parts injured in the domestic competition were shoulder accounted for 19.7% of upper extremities (*P*=0.000) and hamstring (13.6%) as the most commonly reported injury followed by lower back (11.1%) in the lower extremity and face (4.9%) in the head and neck region. Most of the injured participants were treated by the physiotherapist (64.1%), and immediate physiotherapy management maximally required the rest (89.9%) along with icing (63.1%) (*P*=0.000) as described in Table 3.

Overall, the incidence rate of strain injury was 42.42% of players on match play (OR. 0.503, 95% CI. 0.060-4.207). To begin with, we discovered a significant association between the strain injury and the body region; of the injuries that occurred to the upper limb (p. 0.005, r^2. 0.075, OR. 6.428, 95% CI. 1.483-27.861), and injury-related information; while the hard ground condition was responsible most at 10.6% (p. 0.00, r^2. 0.716, OR. 0.005, 95% CI. 0.001-0.022). Moreover, injuries to the batsman were more common, and recent events were closely related to strain injuries (r^2. 0.053, OR. 0.376, 95% CI. 0.183-0.770 and r^2. 0.071, OR. 0.308, 95% CI. 0.147-0.648). At the same time, compared with demographic characteristics such as age (p. 0.708), BMI (p. 0.166), and different divisional athletes (p. 0.982), the observed value of this muscular injury had no significant relationship. In fact, sports physiotherapists most often used the PRICE (Protection, Rest, Ice, Compression, and Elevation) method as an instant remedy as part of the initial treatment procedure to minimize or prevent further tissue damage. Facts have proved that the statistical relationship of turning to strain injury management was most effective in the application of PRICE, and athletes could continue sporting activities (p. 0.00, r^2. 0.180, OR. 11.989, 95% CI. 4.255-33.776 and p. 0.00, r^2. 0.065, OR. 3.239, 95% CI. 1.496-7.012) (Table 4).

Table 4.Associated risk factors of the sports injury in cricket

Characteristics		Strain Injury		Odd Ratio (OR)	95% Confidence Interval (CI)	
		Yes	No		Lower	Upper
Age	>25	60	18	0.877	0.441	1.743
	<25	95	25			
BMI	>18.5	2	2	0.268	0.037	1.960
	18.5-24.9	153	41			
1st Division Player	Yes	79	22	0.992	0.505	1.950
	No	76	21			
Injury Time	Game	148	42	0.503	0.060	4.207
	Warm-up	7	1			
Warm-up	Yes	5	2	0.683	0.128	3.651
	No	150	41			
Protective Equipment	Yes	148	42	0.503	0.060	4.207
	No	7	1			
Batsman	Yes	33	18	0.376	0.183	0.770
	No	122	25			
First Bowler	Yes	2	1	0.549	0.049	6.203
	No	153	42			
Recent Injury (>7 days)	Yes	26	17	0.308	0.147	0.648
	No	129	26			
Upper Limb	Yes	37	2	6.428	1.483	27.861
	No	118	41			
Hard Ground	Yes	14	41	0.005	0.001	0.022
	No	141	2			
Collide	Yes	4	1	1.113	0.121	10.222
	No	151	42			
Batting	Yes	148	42	0.503	0.060	4.207
	No	7	1			
Nutrition	Yes	6	5	0.306	0.089	1.057
	No	149	38			
Playing Field	Yes	140	37	1.514	0.549	4.171
	No	15	6			
PRICE Management	Yes	149	29	11.989	4.255	33.776
	No	6	14			
Continue Sporting	Yes	133	28	3.239	1.496	7.012
	No	22	15			

Discussion

Cricket is one of the most popular and played sports among other outdoor games in Bangladesh. Due to the high popularity, the frequency of players throughout the year is higher than before (13), so there is not enough time to recover from injuries. Therefore, in a few cases, elite athletes who lost the game paid a high price, while in severe cases, cricketers had to withdraw from sports. This study reported the strain injury among the cricketers that occurred around 96% during the competition mostly at the time of running (42.9%) and approximately 80.3% drawn back from the game.

Analysis of the results found that incidence of strains or muscle tear in the domestic matches belonged to almost half that of other injuries in the Bangladeshi domestic tournaments (42.4%). An epidemiological study of New Zealand cricketers, likewise, showed that muscle tears or strains were the most common injury mechanism in domestic (45%) contest (10).

Especially, every cricketer was considered to his primary skill. Among the participants, the playing position predominantly was incorporated with the strain injury among the cricket players. Also, further binary regression analysis proved the injury most common amid the batsman with the OR of 0.376 (CI: 0.183-0.770), while the first bowler had a greater OR of 0.549 (CI: 0.049-6.203). For this reason, pay more attention is required to the use of batter protection devices (OR: 0.503, CI: 0.060-4.207), focusing on improving the skills of batting and bowling, and improving the physical fitness of batsman and bowler to prevent injuries. To put our argument in another way, a descriptive study of Stretch and colleagues (14) indicated that incidence of bowler injury was

47.4% higher than that of cricketers (29.8%) and wicketkeepers (22.8%). Thus, the possible reason for the higher incidence was the constant relationship between high bowling workload and injuries in that study (15).

The study explored the significant correlation between the incidence of strains that often occurred throughout domestic competitions, instead of warm-up and physical exercise, and the chance of experiencing a strain in the tournament was 0.503 times higher than the probability of injury during warm-up (95% CI: 0.060-4.207). By the same token, some studies have found that overall incidence of competition injury in New Zealand's domestic competition (27.2 per 10,000 athlete hours) was equal to the lower limit of the Australian domestic competition incidence range (27.3-33), which was less than that for South Africa in the 2004–2006 session (7, 9-10).

In terms of injuries to body parts, the severity of strains (P=0.00) was significantly prone to 6.428 (95% CI. 1.483-27.861) times more compared to non-upper limb injury. According to Frost and Chalmers (10), the lower extremities were the most vulnerable body regions (47.3%), followed by the trunk/back (25.1%; 37.1%) and upper extremities (17.8%; 14.9%). In order to reduce the incidence of injury, the long-term surveillance system (16)need to be established to address sports-related variables to the environment and individuals who injury (17). In addition, our previous study also suggested for footballers with more than 10 years to guide young players in preventing injuries, and cricketers can adopt similar recommendations (18).

Conclusion

The playing position is yet the leading cause of strain injury during the game while protective equipment alone failed to reduce injury. Findings of this study indicated that incidence for the most part came up at the time of running and particularly the shoulder joints were easily injured. It appears that predictors of strain injury are expected based on PRICE management and the treatment protocol is effective in resuming the athletic activity. As there is no recognized publication on musculoskeletal injuries in Bangladeshi athletes, it is inconceivable to produce a substantial comparison with the current outcome.

Acknowledgements
The author would like to thank the participants in the team for their cooperation in recording data. The author did not receive any funding, so there is no information about financial support for this study.

Conflict of interest:
None

Funding support:
None

Authors' contributions:
All authors made substantial contributions to the conception, design, analysis, and interpretation of data.

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