



ORIGINAL PAPER

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## An experimental analysis of different point specific musculoskeletal pain among selected adolescent-club cricketers in Dhaka City

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### ABSTRACT

**Introduction.** Musculoskeletal disorders (MSDs) are considered to be among the most stressful events of human body considering their onset, symptoms and the ultimate consequences.

**Aim.** This study was conducted to provide a concise overview of cricket-related musculoskeletal pain of the upper limb and lower limb region in male adolescent cricketers.

**Material and methods.** Data was collected from three clubs in Dhaka city, and the participant's age group was 10-19 years. Data was collected through oral conversations with participants and physical testing. This process was continued over six months, which repeated monthly between same subjects.

**Results.** 97 cricketers experienced musculoskeletal pain, where maximum reported upper limb musculoskeletal pain was 33.3% shoulder, 21.6% elbow, 27.5% wrist, and 17.6% hand pain. In contrast, 46 candidates were found in the lower limb musculoskeletal pain category containing 19.6%, 30.4%, 30.4% and 19.6% hip joint, knee joint, ankle joint and foot joint musculoskeletal pain, respectively. BMI had no significant effect on the typical upper and lower limb musculoskeletal pain. Batsmen playing for 4 sessions or more per week are the main victims of upper limb musculoskeletal pain. In contrast, bowlers and all-rounders were the main victims of lower limb musculoskeletal pain under similar workloads.

**Conclusion.** This study reflects an up-to-date overview of regional upper limb and lower limb musculoskeletal pain where the risk of lower limb injury is most common among all types of players.

**Keywords.** adolescent cricketer, musculoskeletal pain, upper limb pain, lower limb pain, practice session

### The list of abbreviations:

MSP – musculoskeletal pain, UL-MSP – upper limb musculoskeletal pain, LL-MSP – lower limb musculo-

skeletal pain, BMI – body mass index, MSDs – musculoskeletal disorders, WHO – World Health Organization, S/W – session per week, H/S – hour per session

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## Introduction

Musculoskeletal disorders (MSDs) are considered to be among the most stressful events of human body considering their onset, symptoms and the ultimate consequences. MSDs are injuries or pain in the human musculoskeletal system, including joints, ligaments, muscles, nerves, tendons and structures that support limbs, neck and back.<sup>1</sup> MSDs are considered highly stressful for the human being enduring it by WHO.<sup>2</sup> It is reported that evidence of having injuries by playing cricket differs from each other depending on the situation. Obviously, the increased rate of injury of the young crickets is directly proportional to the increased number of playing hours.<sup>3</sup> In contrast, statistically, the majority of the adolescent cricketers (~80%) suffering from different extents of MSDs including knee, lower back and shoulder were the three commonly most susceptible anatomical sites of musculoskeletal pain and injuries while, the batsman are the main ultimate victims (~30%).<sup>4</sup> In all the cases, the coaches and the physiotherapists can play an important role in monitoring incidences of MSDs through positive physical and psychological counselling and early rehabilitation programming.<sup>5</sup> Musculoskeletal pain (MSP) is a common arising threat for cricketers and can occur in various ways while playing cricket. Rotation, flexion, extension, abduction rapidly repeated movements are performed by a cricketer and wrist joint, elbow joint, shoulder joint, hip joint, knee joint, ankle joint and many other joints are involving to complete a perfect function.<sup>6</sup> Prevention is always considered to be better than a cure but some cricketers are not getting sufficient physical training and ultimately result is disqualification from the cricket match.<sup>4</sup> Long time performance of high bowling workload is strongly increasing the risk factor of MSP for adolescent fast bowler.<sup>7</sup> MSP commonly is found mainly in the lower limbs (~49%) and partially to the upper limbs, back and trunk and soft tissue predominantly muscle is highly affected as well as joint, tendon and ligament in musculoskeletal injury.<sup>8</sup>

Proper designing of exercise therapy plays a vital role for adolescent cricketers. The design may consist of stretching and strengthening techniques in various joints and it can be active and resistive. Passive stretching helps to increase range of motion (ROM) especially for hip joint which is why clinicians and coaches prescribe passive stretching for improvement of individuals.<sup>9</sup> To make an effective treatment design for players, appropriate injury records and data collection is also important for reduction, prevention, treatment and rehabilitation.<sup>10</sup> Reduction and prevention methods are applied before or during game by different kinds of exercises and use of components for support like knee brace, elbow brace, arm band, kinesio tape and others. Pain killers (some injected), stretching, strengthening, slid-

ing, and gliding techniques are applied initially during match and hospitalization if required. Hard and uneven ground can also responsible for sudden severe soft tissue injury.<sup>11</sup> Rehabilitation programs start after match which is decided on by the discussion of physicians, coaches and the injured players. Effectiveness of postural rehabilitation plays a vital role also in preventing MSP.<sup>12</sup> Prevention of interference with daily activities is most effective for the treatment of MSP.<sup>13</sup> Scientific studies help to measure common risk factors of adolescent cricketers. Prevention, reduction and preparation for MSP will be a future concern.

Considering all the aforementioned data, our research was conducted for the following objectives such as identification of the prevalence of MSP among adolescent cricketers with their socio-demographic factors, considering their received treatment during training and finally revealing whether there's any correlation between these factors and MSP.

## Aim

This study aimed to find out the musculoskeletal pain at various anatomical sites and relationship between musculoskeletal pain and work load among adolescent cricketers.

## Material and methods

### *Participants*

The study was conducted on those groups of candidates who had started their yearly training before 1 month and will continue for 5 months without any rehabilitation protocol. Inclusion criteria of participating candidates, who were willing to participate in the study was an age group 10-19 years, a club player, and male adolescent crickets because female candidate were less in number and were not comfortable participating. Data were not taken from participants below 11 years old or above 19 years old avoiding those histories of musculoskeletal pain which lead to physical disability and/or disease condition. The study activity started with the random selection of 110 cricketers and an oral conversation with questioners. This included a blind interview process by the request of participants. The study was conducted from different cricket clubs including - Kolabagan Cricket Academy, Abahoni Club Dhanmondi and Uttara Friends Club Cricket Academy of Dhaka city.

### *Data processing*

The research actively started with the random selection of 110 cricketers and their oral conversation with the given questioners as followed by physical testing, inspection (symmetry, swelling, muscle atrophy), palpation (warmth, tenderness, trigger points) and joint range of motion by the passive, active and resisted movement of flexion, extension, abduction, adduction

internal rotation and external rotation. Some special tests performed when collecting data were the empty can and drop arm test, external rotation lag sign, belly press and lift off test for t shoulder joint assessment, Cozen's test, golfer's elbow test, hook test,<sup>19</sup> Finkelstein's test, Tinel's sign, Murphy sign for the upper limb physical assessment, FABER (Patrick's) test, Trendelenburg sign, AB-HEER test, the prone instability test, HEER test, anterior drawer test and posterior drawer test, patellar grind test, Varus stress test and Valgus stress test for the lower limb physical assessment and neuro-dynamic test.<sup>14-26</sup> Musculoskeletal pain assessed by numeric pain rating scale where the intensity of pain was defined as mild, moderate and severe.<sup>27</sup>

#### Data analysis

After collection of data, all interview questionnaires were checked for completeness correctness and internal consistency to exclude missing or inconsistent data. Corrected data was entered into a computer. The data was analyzed by using SPSS (Statistical Package for Social Science) version 22 and Graph Pad Prism (version 5.0, Graph Pad Software, San Diego, CA, USA). Prior to data collection, permission from the ethical committee of the State College of Health Sciences was taken.

#### Results

Among the 110 participants, approximately 16.4% (n=18) were among the age group 10-15 and 83.6% (n=92) were among the age group 16-19. Among them, the second group has the highest mean age (16.94±1.191 years). Between them, more than half (54.5%, n=60) of the players were all-rounder, 26.4% (n=29) of the players were batsman, and 19.1% (n=21) of the players were bowlers according to the specialty of playing match. Among them, the All-rounder had the highest percentage and the lowest percentage was bowler. On the other hand, 23.6% (n=26) were left hand batsman and 76.4%

(n=84) were right hand batsman and 22.7% (n=25) were left hand bowlers and approximately 77.3% (n=85) were right hand bowlers.

In the research, 51 candidate cricketers showed upper limb musculoskeletal pain (UL-MSP) with 33.3% shoulder joint pain, 21.6% elbow joint pain, 27.5% wrist joint pain, 17.6% hand joint pain. In contrast, 46 candidates were found in lower limb musculoskeletal pain (LL-MSP) category containing 19.6%, 30.4%, 30.4% and 19.6% hip joint, knee joint, ankle joint and foot joint MSP, respectively (Table 1). We found p value as chi-square test of R1,R2,R3,R4 and R5 in UL-MSP respectively 0.410, 0.725, 0.435, 0.263 and 0.166 on the other hand LL-MSP 0.537, 0.471, 0.359, 0.471 and 0.687, respectively (Table 1). According to numeric pain rating scale this research shows, Replication 1 showed UL-MSP with 31.4% (n=16) mild pain, 47.1% (n=24) moderate pain, 21.6% (n=11) severe pain. In contrast, LL-MSP containing 26.1% (n=12), 58.7% (n=27) and 15.2% (n=7) mild, moderate and severe pain, respectively. Replication 2 showed UL-MSP with 27.5% (n=14) mild pain, 54.9% (n=28) moderate pain, 17.6% (n=9) severe pain. In contrast, LL-MSP containing 19.6% (n=9), 65.2% (n=30) and 15.2% (n=7) mild, moderate and severe pain, respectively. Replication 3 showed UL-MSP with 35.3% (n=18) mild pain, 39.2% (n=20) moderate pain, 25.5% (n=13) severe pain. In contrast, LL-MSP containing 30.4% (n=14), 47.8% (n=22) and 21.7% (n=10) mild, moderate and severe pain, respectively. Replication 4 showed UL-MSP with 35.3% (n=18) mild pain, 47.1% (n=24) moderate pain, 17.6% (n=9) severe pain. In contrast, LL-MSP containing 30.4% (n=14), 60.9% (n=28) and 8.7% (n=4) mild, moderate and severe pain, respectively. Replication 5 showed UL-MSP with 27.5% (n=14) mild pain, 51.0% (n=26) moderate pain, 21.6% (n=11) severe pain. In contrast, LL-MSP containing 26.1% (n=12), 63.0% (n=29) and 10.9% (n=5) mild, moderate and severe pain, respec-

**Table 1.** Male Cricketers of different groups suffering from locus specific MSP

Replication of subjective data assessment	Locus of musculoskeletal pain (MSP)									
	Upper limb (UL)					Lower limb (LL)				
	p Value	Shoulder joint	Elbow joint	Wrist joint	Joints of hand	p Value	Hip joint	Knee joint	Ankle joint	Joints of foot
R1	0.410	17	11	14	9	0.537	9	14	14	9
R2	0.725	16	11	13	11	0.471	8	13	15	10
R3	0.435	17	10	14	10	0.359	9	15	14	8
R4	0.263	18	12	13	8	0.471	10	15	13	8
R5	0.166	17	11	16	7	0.687	9	13	14	10
Average (%)		33.30	21.60	27.50	17.60		19.60	30.40	30.40	19.60

\* N refers the number of candidates in all categories; R is for the replication/rounds of data collection and assessments from different player groups

\*\* p value marked as chi-square test which indicated that there is no significant relationship between UL-MSP and LL-MSP.

tively. 13 cricketers were observed to be safe from all types of MSP in our research. The intensity of pain experienced by candidates was 27.2% mild, 53.2% moderate and 17.7% severe. 13 cricketers were observed to be safe from all types of MSP in our research.

In the research, 51 candidates showed UL-MSP with 15.7% (n=8) underweight and 84.3% (n=43) normal weight of BMI. In contrast, LL-MSP containing 19.6% (n=9) and 80.4% (n=37) underweight and normal weight, respectively (Figure 1). On the other hand, 23.1% (n=3) underweight and 76.9% (n=10) normal weight of BMI who has not found MSP.

In this study, 51 cricketers who were in UL-MSP, out of them 11 batsman played respectively (n=3) 2 hour per session (H/S), (n=3) 3 H/S and (n=4) 5 H/S between 3 session per week (S/W) also 4 batsman played (n=2) 2 H/S and (n=2) 5 H/S between 5 S/W (Figure 2a), 13 bowler played (n=8) 3 H/S, (n=3) 5 H/S between 3 S/W and (n=1) 2 H/S, (n=1) 3 H/S between 5 S/W (Fig-

ure 2b) and 24 all-rounder played (n=3) 2 H/S, (n=3) 3 H/S, (n=2) 5 H/S between 3 S/W on the other hand (n=5) 2 H/S, (n=5) 3 H/S and (n=6) 5 H/S between 5 S/W (Figure 2c). 46 cricketers who were in LL-MSP out of them 10 batsman played respectively (n=2) 2 H/S, (n=2) 3 H/S and (n=1) 5 H/S between 3 S/W also (n=1) 2H/S and (n=4) 5 H/S between 5 S/W (Figure 2d), 13 bowler played (n=1) 2 H/S, (n=7) 3 H/S and (n=4) 5 H/S between 3 S/W also (n=1) cricketer played 2 H/S between 5 S/W (Figure 2e) and 23 all-rounder played (n=4) 2 H/S, (n=2) 3 H/S, (n=4) 5 H/S between 3 S/W also (n=3) 2 H/S, (n=4) 3 H/S and (n=6) 5 H/S between 5 S/W (Figure 2f). 13 cricketers who has no MSP out of them 7 batsman played (n=4) 2 H/S and (n=3) 3 H/S between 3 S/W also 1 bowler played (n=1) 2 H/S between 3 S/W and 5 all-rounder played (n=4) 2 H/S, (n=1) 3 H/S between 3 S/W.

Batsmen playing for 4 sessions or more per week were the main victims of UL-MSP, below 4 sessions

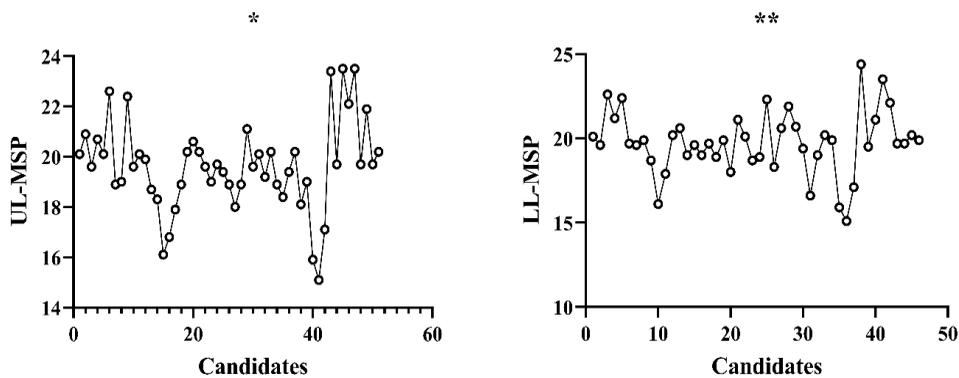


Fig. 1. Comparative analysis of the variance of BMI level between the UL-MSP (\*) and LL-MSP (\*\*) player groups

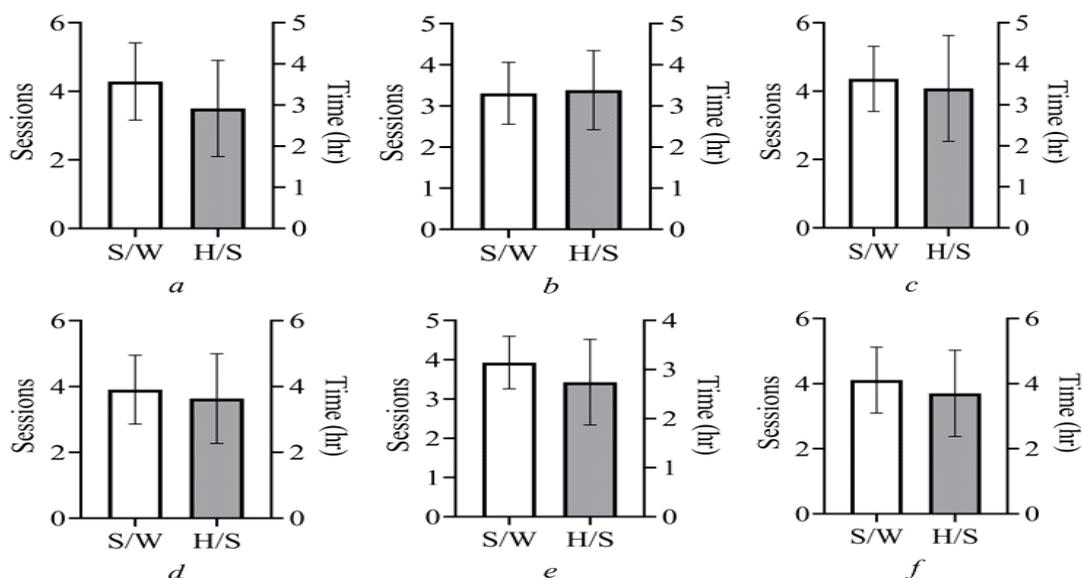


Fig. 2. Comparative analysis of upper limb and lower limb musculoskeletal pain between batsman, bowlers and all-rounders based on sessions and hours, S/W - session per week, H/S - hour per session

LL-MSP (Figure 2a; 2d) in our research. The bowlers performing 4 or more sessions per week are suffering from LL-MSP compared to the upper limb group (2b; 2e). Furthermore, the all-rounders playing more than 4 sessions have UL-MSP as compared to the all-rounders playing below 4 sessions per week (Figure 2c, 2f).

## Discussion

In this research, 51 candidate cricketers showed upper limb musculoskeletal pain with 33.3% shoulder joint pain, 21.6% elbow joint pain, 27.5% wrist joint pain, 17.6% hand joints pain. In contrast, 46 candidates were found in lower limb musculoskeletal pain category containing 19.6%, 30.4%, 30.4% and 19.6% hip joint, knee joint, ankle joint and foot joint MSP, respectively (Table 1). That situation directly reflects the findings of Noorbhai.<sup>4</sup> Additionally, Saayman mentioned the front foot hip joint pain and lower back pain (LBP) of the fast bowlers which are highly concerning to the final team combination selection.<sup>28</sup> Ranges of treatment options have been implemented on the basis of injury level and players response to the injury. Few have suggested by Rao especially to sufferer from foot and ankle pain.<sup>29</sup>

Gregory stated that the fast bowlers experienced higher frequency of injury than the spin bowlers, where, the sustainability of injury was 8.6%, 11.4% and 2.3% higher.<sup>30</sup> In contrast, the spin bowlers were at ~7% higher risk of shoulder injury. High prevalence of moderate pain noticed in our study which is directly reflects the findings of Noorbhai.<sup>4</sup> 13 cricketers were observed to be safe from all types of MSP in our research.

BMI has found no significant effect on the typical upper and lower limb musculoskeletal pain formation (Figure 1) in the research which is directly similar with the findings of Das.<sup>31</sup> But Talupuru showed the evidence of BMI effect on overall batting performance for gripping and hard hitting.<sup>32</sup> Furthermore, BMI has found a tremendous relationship for returning to sports of an athlete. John stated a significant study between returning of sports of professional cricket players and armature cricket players. His research also showed those players with more come-back-chances who have less than 25 BMI.<sup>33</sup> For the adolescent players, BMI plays important role in their performance and sporting attitude.

Considering age and health condition like pain in lower limbs including knees and hips, BMI is considered as one of the main reasons of injury by Stovitz.<sup>34</sup> Age and BMI explained only 1.9% of the variance in pain generation of individuals as reported by Wright.<sup>35</sup> Which directly opposite to the aforementioned ideas of Stovitz,<sup>34</sup> Which is directly similar to our findings (Figure 1).

Orchard, Drew and many others report that workload is mainly responsible for musculoskeletal injury of adolescent cricketers which is directly similar to our

findings.<sup>36-38</sup> In this study, mainly all-rounders are main victim of MSP rather than bowlers. These findings are dissimilar with a previous study on adolescent cricketers in KwaZulu-Natal, where injuries to all-rounders 28% and batsman 30% mentioned by Noorbhai.<sup>4</sup> On the other hand, Sathya and Parekh stated that all-rounders received maximum injuries of 70% and bowlers 60% which directly reflects our study.<sup>39</sup> Batsmen playing for 4 sessions or more per week are the main victims of UL-MSP which agrees with Hulin.<sup>40</sup> While, below 4 sessions are of LL-MSP (Figure 2a; 2d) in our research. Most of the adolescent participants usually suffer from LL-MSP over that of their UL-MSP conditions on a usual basis according to Garbenytè-Apolinskienė.<sup>41</sup> The bowlers performing 4 or more sessions per week are suffering from LL-MSP more than that of the upper limb group (2b; 2e). Furthermore, the all-rounders playing more than 4 sessions have UL-MSP as compared to the all-rounders playing below 4 sessions per week (Figure 2c, 2f). Sathya and Parekh stated that all-rounders are mainly suffering from LL-MSP which is not in agreement with our findings.<sup>39</sup> MSP is co-related to sporting attitude that's why it cannot be measured.

Shoulder pain has become very acute in that case when the participants fall into the category of 10 to 19 years or from the little league of sports observed by Drescher.<sup>42</sup> Things are quite different for the healthy adult players of either professional or non-professional cases mentioned by Dannecker and Koltyn.<sup>43</sup>

## Conclusion

This study represents that male adolescent cricket players residing in Dhaka city have high prevalence of musculoskeletal pain. A more concise overview reflects the regional upper limb and lower limb musculoskeletal pain where the risk of upper limb injury is most common between all types of players. Shoulder joint and wrist joint from upper limb region relatively knee and ankle joint was mainly affected to musculoskeletal injury. This study also noticed a strong impact between musculoskeletal pain and workload. Mainly all-rounders followed by bowlers are main victims of lower limb musculoskeletal pain and batsman are the main victims of upper limb musculoskeletal pain due to workload. Parents, guardians and coaches should pay specific caution to reduce exacerbating factors causing musculoskeletal pain and also pay strong attention for the rehabilitation protocol.

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