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ANALYSIS OF HYDRATION STATUS AND ITS IMPACT ON OVERUSE INJURIES AMONG MALE COLLEGIATE RECREATIONAL CRICKET PLAYERS: A CROSS-SECTIONAL STUDY

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ABSTRACT:

Hydration is important to maintaining physiological function at optimal level, improving athletic performance, and reducing risk of injuries. Yet, limited research explores the direct relationship between hydration and overuse injuries in male recreational cricket players. This study aimed to assess hydration status and its correlation with the incidence of overuse injuries—particularly of the knee, lower back, and shoulder—among male collegiate recreational cricket players. A cross-sectional observational study was conducted among 51 male collegiate recreational cricket players aged 18–24 years. Hydration status was measured using the Beverage Intake Questionnaire (BIQ), while overuse injuries were measured using the Oslo Sports Trauma Research Centre (OSTRC) Overuse Injury Questionnaire respectively. Spearman's rho correlation was used to determine the relationships between hydration status and incidence of overuse injuries. A statistically significant weak negative correlation was observed between hydration status and knee overuse injuries ($r = -0.278$, $p = 0.049$), which suggests that lower hydration levels may be linked to increased knee injury risk. No significant association was found between hydration status and injuries to the shoulder ($r = 0.045$, $p = 0.754$) or lower back ($r = 0.107$, $p = 0.455$). While cause cannot be established, the results propose that poor hydration may contribute to a greater chance of knee overuse injuries in male collegiate cricket players. These finding emphasize the importance of proper hydration strategies vital for musculoskeletal health and injury prevention. Further research in the future with objective hydration markers and a larger sample size is warranted.

Keywords: Overuse Injuries; Hydration Status; Recreational Athletes; Collegiate Cricket Player; OSTRC Questionnaire; Beverage Intake Questionnaire (BIQ); Sports Medicine; Injury Prevention; Spearman's Correlation.

INTRODUCTION

Athletes, from recreational to elite levels, have particular physiological needs on their bodies that necessitate proper diet and hydration for peak performance, injury prevention, and quick recovery.[1] Hydration is an important aspect in injury prevention since it affects healing and hormones. Proper hydration can help athletes to cope with competition or training.[2] Hypohydration has numerous detrimental impacts, including an increased risk of injury and impaired sports performance.[2] Several studies have indicated high levels of hypohydration among athletes at all levels of sports.[2] In order to minimize the impact of injuries and modifications to their hormonal regulatory systems, athletes must maintain adequate hydration levels during training and competition.[2]

The adult literature has consistently shown that dehydration increases the rate at which the core temperature rises and puts additional stress on the cardiovascular system when exercising, particularly in hot weather. Consequently, hypohydration decreases motivation, increases weariness and the sense of effort, and hinders physical performance (mostly endurance exercises). However, hyperhydration is also undesirable, especially when combined with significant sweat sodium losses and excessive use of low-sodium or sodium-free beverages.[3]

Dehydration is described as the process of losing bodily water. Hypohydration, on the other hand, occurs when the body has a water deficiency.[4] Mild dehydration, defined as a loss of 1-2% body fluids, can cause a decline in attention, memory, and an increase in anxiety.[4] Severe hypohydration occurs when the body loses 2-4% of its water weight, particularly during periods of sustained sweat loss.[4] Dehydration in athletes can affect performance and result in acute renal failure, exertional heat sickness, vomiting, and a drop in awareness. Athletes are frequently dehydrated when they commence exercising.[4] The Obesed individual will have 45–55% water, but a lean body will have 60–70% water.[4]

Even though there is an understanding of the implications of dehydration and its detrimental impact on performance, athletes frequently neglect to implement suitable hydration practices. For instance, earlier studies indicate that athletes typically do not possess sufficient knowledge of the key indicators necessary for managing their hydration levels effectively.[5]

Although substantial research indicates that dehydration can negatively impact endurance performance, the fluid requirements during competitions can change significantly. These differences can be ascribed to a number of factors which includes the type of the sport, the athlete's level of experience, and surrounding conditions.[6] The recommended total water intake for young men and women is estimated to be between 2.7 and 3.7 litres each day.[6] It is generally believed that food accounts for 20 to 30% of the total amount of water in the diet, of which 70–80% comes from liquids. However, this correlation can change based on the kinds of beverages consumed and the selection of foods.[7]

Musculoskeletal disorders (MSDs) refer to injuries affecting the musculoskeletal system, which can also be referred to as “repetitive motion injury,” “repetitive stress injury,” or “overuse injury”.[8] These Conditions are among the most common and expensive injuries that impact the lives of affected individuals. Since MSDs are

caused by a number of factors, the introduction of a comprehensive musculoskeletal health initiative could be helpfull.[8] Musculoskeletal disorders (MSDs) can impact various regions of the body, such as the shoulders and limbs (arms, legs, feet, and hands), neck, as well as the upper and lower back.[8]

Nowadays, sports injuries are basically classified into two types: acute injuries and overuse injuries. Acute injuries are caused by a trauma or by a single, identifiable event. Overuse injuries, on the other hand, are not associated with a single specific occurrence. It is believed that overuse injuries occur from repeated low-level stress on the musculoskeletal system without necessary recovery time. These injuries are the result of micro-trauma caused by frequent force exposure or excessive repetitions. Initially, the tissue often recovers without apparent signs or symptoms, but as the condition progresses, the ability to adapt decreases, leading to noticeable clinical symptoms.[9]

Overuse injuries are recognized as a prevalent cause of injuries among young athletes, with nearly 50% of sports injuries in children and young adults classified as overuse injuries. These injuries can affect bones and soft tissues.[9]

One of the hardest things for those who work in athlete care is lowering the risk of injuries and health issues associated with playing sports.[10] In Youth athletics, this subject is particularly significant due to the rising demands for training and competition within this group.[10]

The Overuse Injury Questionnaire created by the Oslo Sports Trauma Research Centre (OSTRC) was designed to tackle issues that occur when relying on conventional sports injury monitoring techniques to record the incidence of overuse injuries.[11] The Questionnaire consists of four areas that aim to assess the impact of overuse injuries on athletes: (1) participation in sports, (2) training load, (3) athletic performance, and (4) pain experienced.[11] The OSTRC Overuse Injury Questionnaire was created to gather data on overuse injuries affecting particular, specified anatomical regions.[11]

Cricketers often experience physical stress due to repetitive actions and intense game, which can make them more susceptible to musculoskeletal issues that impact various parts of the body.[12] They also experience a range of injuries, both acute and chronic, such as craniofacial injuries, lumbar stress conditions, abdominal strains, and various injuries affecting the upper and lower limbs.[13] These types of injuries occur frequently in bowling, specifically in players who balls fast.[13]

AIMS AND OBJECTIVES

AIM:

The purpose of the study is to examine the hydration status of male collegiate recreational players and assess how they relate to the incidence of overuse injuries. The study aims to evaluate how hydration affects both injury prevention and overall sports performance by exploring hydration levels and their relationship to injury prevalence.

OBJECTIVE:

- ✓ Assessing the hydration levels of the players using standardised tools like Beverage assessment questionnaire.
- ✓ Assessing the prevalence of overuse injuries among male collegiate cricket players using OSTRC questionnaire.
- ✓ Evaluating the relationship between hydration status and the prevalence of overuse injuries.

NEED OF THE STUDY:

- ✓ The direct relationship between hydration and overuse injuries severity in male collegiate cricket players has not been studied.
- ✓ There are lots of researches available on overuse injuries available on data base but direct relation between hydration and overuse Injuries is less.
- ✓ Prevalence of overuse injuries is increasingly common among college athletes due to high training periods and repetitive stress on joints.

HYPOTHESES

NULL HYPOTHESES: There is no significant difference of hydration status and its impact on overuse injuries in male collegiate recreational cricket players.

ALTERNATE HYPOTHESES: There is significant difference of hydration status and its impact on overuse injuries in male collegiate recreational cricket players.

REVIEW OF LITERATURE

Yarasheva Dilnoza (2024) conducted a study on thirteen female handball players, ages 16.7 ± 0.7, participated in the study, which evaluated their level of hydration on match day. Prior to the game, morning measurements revealed that three players were euhydrated and ten players were dehydrated. All players were discovered to be properly hydrated following the game, nevertheless. The study observed substantial differences in body weight and urine specific gravity (USG) before and after the game. It also tracked changes in body weight, fluid intake, and USG throughout the day.[14]

E Conland (2024) conducted a study to examine the association between dance training hours and injury incidence, as well as the effects of musculoskeletal complaints on pre-professional dancers' performance and pain levels, using the (OSTRC-O). 21 pre-professional dancers (average age 17.6, 72% female) participated in the study. They danced for an average of 30.9 hours a week, which included 10.2 hours for practice, 9.5 hours for class, and 2.6 hours for performance. They spent a mean of five hours a week on other activities

other than dancing. There were 42 musculoskeletal complaints recorded, representing nearly all participants (95%) with a prevalence of 200 injuries/100 persons and an incidence rate of 9.5 injuries/1000 dance hours. According to a study of pre-professional dance students, 54% of them danced with mild to severe discomfort, while 95% reported musculoskeletal issues during periods of intense training. Few took time off in spite of this, indicating a great desire to keep dancing while being hurt. Although it was not statistically significant, the study also discovered a positive correlation between dance hours and musculoskeletal problems.[15]

Hetaimish, Bandar (2024) conducted a study to determine the prevalence of overuse injuries among Saudi gym goers, compare injuries across different gym activities and session durations, and identify risk factors for these injuries. According to this study, which polled 1012 gym patrons, the majority were men (76.2%), between the ages of 26 and 30 (52.6%), and from the Central Province (42.9%). The most popular sports were weightlifting/powerlifting (45.1%), bodybuilding (50.6%), and running (45.8%). The most common injuries were to the shoulder (25.2%), knee (20.2%), and lower back (17.7%), followed by strain/muscle rupture/tear (35.7%) and muscular cramps/spasm (19.3%). The majority of injuries were self-identified (40.8%) or diagnosed by a coach (29.6%), and longer gym sessions (>2 hours) were associated with an increased risk of strain, muscle rupture, tear, and other injuries. The incidence of gym-related injuries indicates that there is need of taking preventative measures. Before beginning gym activities, people should get a physical and medical check to reduce dangers, and they should concentrate on conditioning and skill. To raise awareness and lower gym-related injuries, future research should focus on examining injury rates and preventative tactics, determining risk factors, and creating focused prevention techniques.[16]

Jakub Chodkowski (2024) conducted this review of literature which underlines the significance of nutrition and hydration in boosting athletic performance, preventing injuries, and aiding recovery for both novice and professional athletes. It points out that maintaining proper hydration is essential for minimizing injury risk and enhancing recovery, as lack of hydration can cause muscle fatigue, cramps, and a greater risk of heat-related injuries. Moreover, nutritional approaches, particularly the intake of protein after exercise, play a key role in muscle recovery and reducing inflammation. The review concludes that implementing effective dietary practices, such as ensuring adequate hydration and a well-balanced intake of macronutrients, can greatly decrease injury risk, enhance performance, and speed up recovery.[1]

Xing Wang et al (2023) conducted a study in Beijing, China, 45 young male athletes participated in a 7-day cross-sectional study that examined the relation between physical activity, hydration biomarkers, and water intake. The study discovered that while hydration biomarkers were similar, athletes with higher levels of physical activity had higher total water intake (TWI) and total drinking fluids (TDF). The median water from food, TWI, and TDF were 1088 mL, 1653 mL, and 2771 mL, respectively. TWI, TDF, and energy expenditure from physical activity were found to be significantly correlated. But a significant rate of dehydration was noted, emphasizing how crucial it is for sportsmen to drink enough water.[17]

Lawrence W. Judge et al (2021) conducted a study on collegiate track and field throwers, 50.5% of subjects wonder that thirst was a sign of dehydration, even though 97.3% of respondents acknowledged that dehydration impairs performance. Athletes who planned to follow a performance-enhancing diet and those who drank less fluid than advised showed significantly different hydration habits, according to the study. A considerable correlation between behaviour and knowledge was found by correlation analysis, emphasizing the necessity for health personnel and strength and conditioning coaches to monitor and educate hydration practices in order to maximize performance.[18]

Stefan Fröhlich et al (2020) conducted a study to examine the association between traumatic pre-injuries and total training load, as well as knee, back, and hip overuse injuries in female professional alpine skiers who compete during the off-season preparation, which has gotten little attention to date. This study looked into overuse injuries in 26 female professional alpine skiers and found a high response rate of 99.5%. Pre-existing injuries were frequent, with 57.7% of skiers having suffered serious knee injuries and 30.8% requiring knee surgery. The study found a significant prevalence of overuse injuries, particularly in the knee, with technical discipline skiers reporting more back injuries than speed discipline skiers. Notably, previous traumatic knee injuries and high training loads were strongly linked to current knee overuse symptoms. Overuse issues of the knee, hip, and back were somewhat common among female elite competitive alpine skiers during the off-season preparation time. The alpine discipline choices of athletes should inform effective preventative strategies for back overuse issues. According to the current study, traumatic pre-injuries and total training load have a significant impact in the development and prevention of knee overuse injuries.[19]

Danilo Višnjevac (2020) conducted a study to determining the prevalence of overuse injuries in young athletes, their gender distribution and anatomical location, and their influence on training and competition level are the objectives of the study. According to a study of 171 young athletes (99 men and 72 women) between the ages of 15 and 30, 48.5% of them experienced overuse injuries, with knee problems accounting for the majority of cases (40.9% for men and 47.1% for women). The vast majority of athletes with knee injuries reported having minor pain and being able to fully participate in training and competition. Injuries to the shoulders and lower back were particularly common; the majority of athletes reported slight pain and full participation with issues. The study emphasises how crucial it is to treat young athletes' overuse injuries in order to avoid long-term effects. Nearly half of the participants in our study (48.5%) had some form of overuse injury. Female respondents are more likely to report injuries. The knee was the most frequent anatomical location of overuse injuries in both subject groups. The male respondents were somewhat more influential than the knee injury in terms of training and competition level. Lower back injuries had a more significant effect on the female individuals' training and competitive levels. Shoulder injuries had the biggest effect on the respondents' level of competition and training across both sexes.[20]

Ehsanur Rahman et al (2019) conducted a study which focused on assessing the frequency and common types of sports injuries among male cricket players in Bangladesh. A quantitative cross-sectional approach was adopted, surveying 100 injured athletes from Bangladesh Krira Shikkha Protishtan (BKSP) and the Bangladesh Cricket Board (BCB). Significant findings revealed that most injuries occurred among the 18-20

age group, with bowlers being the most affected. Shoulder injuries were common, especially rotator cuff injuries, followed by issues with the hand, fingers, and groin. The research indicated that 71% of injuries were indirect or the result of overuse, with 45.2% categorized as moderate in severity. The majority of participants performed regular warm-up and cool-down exercises. Treatment mainly involved physiotherapy. The study concluded that individuals aged 21-23 are particularly at risk for injuries, emphasizing the role of flexibility and overuse as contributing factors. Enhanced health education and consistent physical activity, paired with physiotherapeutic exercises, are advised to prevent injuries.[21]

Mari Leppänen et al (2019) conducted a study to look into the prevalence and burden of overuse injuries in children's football, as well as player characteristics and their relationship to overuse injury risk. Initially, 740 young soccer players signed up, but 7 dropped out, leaving 733 players (570 boys and 163 girls). Even though 18 players (2.5%) stopped participating throughout the 20-week research, their data was nonetheless recorded. At baseline, anthropometric information was gathered from 569 athletes. According to a study of 733 young soccer players, overuse injuries affected 46.8% of them, with the knees accounting for the majority of these injuries (5.7%). Overuse injuries were more common in older boys (12–14 years old), particularly in the lower back, hips, and knees. Overuse injuries were more common in girls (17.4%) than in males (11.5%). With an incidence rate of 171.8 injuries per 100 person-years, overuse problems lasted an average of 3.9 weeks. Youngsters who play competitive football frequently experience overuse injuries, most frequently to the knee and lower extremities. Since knee overuse issues have the biggest impact on self-reported perceived sports participation and performance, special attention should be paid to preventing them.[22]

R. Aicale et al (2018): This analysis was conducted to explore significant databases up until March 2018 for studies concerning the pathophysiology and prevalence of overuse injuries, employing key phrases like overuse, injury, tendinopathy, stress fracture, and juvenile osteochondritis dissecans (JOCD). Overuse tendinopathy leads to discomfort and inflammation, resulting in reduced exercise capacity and degeneration of tendons. Inadequate training methods and a variety of risk factors may predispose athletes to stress reactions, which can direct the chances of stress fractures. JOCD frequently causes pain in adolescents and is marked by bone necrosis. The purpose of this review is to emphasize the fundamentals of overuse injuries, including tendinopathy and stress fractures, as well as their management implications.[23]

A Hirschmüller et al (2017): This research involved the translation and validation of the Oslo Sports Trauma Research Centre (OSTRC) Questionnaire for application in Germany. Employing a modified back-translation technique, the validation process engaged 24 elite Paralympics athletes over a timeframe of 20 weeks. The translated version of the questionnaire demonstrated high internal consistency (Cronbach's α 0.92) and solid reliability (intraclass correlation coefficient 0.91), achieving an impressive average weekly response rate of 91.5% from the athletes. During the course of the study, a total of 114 training days were lost due to health-related problems, with an average of 5 athletes (20.8%) reporting issues each week. In conclusion, the German OSTRC Questionnaire is a dependable and valid instrument for tracking the health of athletes.[24]

Janaka P et al (2016) : The research investigated the impact of dehydration on cricket-specific motor skills among fast-bowlers, fielders, and batsmen under hot and humid conditions. Participants completed two trials: one with adequate fluid intake (FP) and the other with limited fluids (FR). The findings indicated that while hydration levels within 1% of body weight did not affect performance, a 3.7% decline in body mass during the FR trial resulted in notable fall in the speed of bowling (1.0%) and accuracy (19.8%), along with reduced throwing speed and accuracy. Batsmen also required more time to finish three runs. In summary, moderate to severe dehydration significantly hinders performance, especially for bowlers and fielders, emphasizing the necessity of effective hydration management.[25]

Karen G. Roost et al (2015) conducted a study to assess variations by sport and sex, as well as to evaluate the prevalence and trends of overuse injuries among high school and collegiate players. According to a study comparing overuse injuries in high school and college athletes, female athletes had higher rates than male athletes in similar sports (college rate ratio: 1.25; high school rate ratio: 1.55), and college athletes had a 3.28-fold higher rate of overuse injuries (5.36 vs. 1.64 per 10,000 athlete-exposures). Muscle/tendon strain and tendinosis were the most common diagnoses (college, 19% and 23%; high school, 33% and 24.5%), while lower extremity injuries accounted for 70% of all injuries. Compared to high school players (7.7% and 4.6%, respectively), college athletes experienced more season-ending injuries (5.9%) and needed longer to recover (20.4% >21 days), with stress fractures being a prevalent diagnosis for extended or season-ending injuries. Compared to high school players, college athletes suffer from more frequent and severe overuse injuries. This is probably because of their higher training volume, cumulative micro trauma, and past injury history. Running sports and female athletes are also more vulnerable. In order to establish prevention and early intervention measures, future research should concentrate on the impacts of lifetime sport participation, as focussing solely on college players may not be enough.[26]

P Blanch et al (2015): The investigation examines the occurrence of injuries among fast bowlers in cricket, emphasizing the elevated risk of bone stress injuries in younger athletes (under 22 years old), who encountered 3.7-6.7 times greater than that of older players. On the contrary, bowlers over 31 years of age are 2.2-2.7 times more vulnerable to tendon injuries compared to the young players. This literature did a retrospective review of match exposure and injury records from 215 fast bowlers over 14 years and categorized players into five different age groups to analyze the influence of age on the types of injuries sustained. In summary, being younger is recognized as a significant risk factor for bone injuries, while older bowlers exhibit a greater frequency of tendon injuries, which may be related to existing classification systems.[27]

B Clarsen et al (2014) conducted a study to use a newly created questionnaire to determine the prevalence of overuse injuries among Norwegian athletes participating in five different sports (cross-country skiing, cycling, floor ball, handball, and volleyball). Thirteen weekly questionnaires were completed by 96% of cross-country skiers, 92% of cyclists, 90% of floor ball players, 98% of handball players, and 91% of volleyball players. Of the athletes, 81% completed all 13 questionnaires, and 91% completed at least 11. The frequency of significant overuse issues and all overuse issues in each anatomical site during the course of 13 weeks. While the incidence of significant difficulties were largely constant over the course of the 13 weeks, the prevalence of

all problems tended to be highest at the start of the research in all groups. The proportional effect of overuse issues in every sport's anatomical region, as determined by the adjusted cumulative severity score over the 13-week research. The statistic indicates that volleyball players' knee issues had the most relative impact. While lighter athletes were more likely to experience significant knee issues, female athletes were less likely to experience significant lower back and knee issues, according to the study. On the other hand, athletes who were heavier were more likely to experience thigh issues, including significant ones. These conclusions were derived from multivariable studies that accounted for demographic factors.[28]

Jingzhen Yang et al (2012) conducted a study to investigate the epidemiology of overuse injuries in male and female collegiate athletes. Fifty-three percent of the 573 injured athletes in a three-year research had conducted to know the number of overuse and acute injuries, found multiple injuries, totalling 1317 injuries. Injuries prevalence in male athletes was 70.7% traumatic, 29.3% Overuse, and 612 for female athletes. In similar sports, there was no significant difference in the types of injuries by sex. A three-year research was done to find the rates of overuse and acute injuries of 16 teams discovered 208,666 athlete exposures (AEs), with an overall injury rate of 63.1 per 10,000 AEs. Overuse injuries prevalence found at a rate of 18.5 per 10,000 AEs, while traumatic injuries happened at 44.6 per 10,000 AEs. Female athletes had greater chance of having overuse injuries than male athletes, but the imbalance was less encountered in similar sports. The study discovered that women's hockey had the highest overuse injury rate (70.5 per 10,000 athlete-exposures), while women's soccer had the highest acute injury rate (190.0 per 10,000 AEs). Football had the highest ratio of acute to overuse injuries, followed by men's basketball and wrestling. In contrast, women's rowing, swimming, and diving had the lowest injury rates. The three most occurred overuse injuries were overall Stress (26.7%), inflammation (20.7%), and tendinitis (15.5%), affecting 103, 80, and 60 athletes, respectively. Soft tissue injuries caused 62.7% (n=584) of traumatic injuries. Lower limb injuries were most occurred injuries, accounting for 49.0% of overuse injuries and 49.7% of acute injuries. More research is needed to determine why female athletes are at a higher risk for overuse injuries, as well as the optimal strategies for prevention and rehabilitation of these injuries.[29]

Craig A. Williams et al (2012) conducted this study to examined electrolyte losses, fluid intake, and hydration status in 21 male youth professional soccer players (average age: 17.1 years) who trained in chilly weather. 14 participants were found to be hypo hydrated before to training, according to measurements made before and after. Exercise resulted in an average body mass loss of 1.7%, indicating mild dehydration. Even though the majority of athletes were able to restore their hydration status throughout training, just four of them remained hypo hydrated after training, with an average of only 46% of sweat losses returned. Sweat loss was found to be strongly inversely linked with magnesium concentrations, but not with sodium or potassium levels. Many athletes started their workouts in less than ideal condition, which emphasises the significance of making sure you are properly hydrated before training.[30]

METHODOLOGY

Study design: Mixed study (Qualitative and Quantitative)

Sampling method: Convenient Sampling

Sample size: 51

Age: 18-24 years

Study duration: 6 Months

Study Place: Teerthanker Mahaveer University, Moradabad

INCLUSION CRITERIA:

- ✓ Athletes of the age group (18-24 years).
- ✓ Recreational athletes actively engaged at college cricket level for more than one year.
- ✓ Recreational athletes with cricket related chronic overuse injuries.
- ✓ Subjects who are willing to participate in study and ensure reliable self- reporting questionnaire.
- ✓ Individual with no history of any neurological and cardiovascular condition

EXCLUSION CRITERIA:

- ✓ Professional cricket players at the collegiate, zone, national and international level.
- ✓ Participants with any comorbidities e.g. Diabetes, hypertension, etc.
- ✓ Subjects who have any memory and cognitive impairments and are unable to provide reliable self reporting data.
- ✓ Athletes taking performance enhancing medications.

SELECTION OF VARIABLES

Independent variable

Male collegiate recreational cricket players

Dependent variable

OSTRC Questionnaire Score and Beverage Intake questionnaire Score

INSTRUMENTATION:

- ✓ OSTRC Questionnaire for overuse injury prevalence. (The questionnaire used in the study was adopted from Benjamin Clarson et al 2013).[11]
- ✓ Beverage Intake Questionnaire for hydration Status.(The questionnaire used in the study was adopted from from Hedrick et al 2010).[31]
- ✓ Consent form
- ✓ Pen



Fig. 1: Data collection from participants.

PROCEDURE:

- ✓ A cross-sectional observational study was carried out with male collegiate recreational cricket players.
- ✓ Convenient sampling was used to choose participants according to predetermined inclusion and exclusion criteria.
- ✓ All participants received a brief explanation of the study before data collection began, and formal informed consent was acquired.
- ✓ One session consisted of each participant completing two validated questionnaires: The Beverage Intake Questionnaire (BIQ), which evaluates fluid consumption patterns and hydration practices. To document whether overuse injuries exist and how severe they are, utilize the OSTRC Overuse Injury Questionnaire.
- ✓ The researcher watched over the self-administered questions to make sure they were thorough and understood.
- ✓ To ensure participant confidentiality, all data obtained was anonymised and coded.
- ✓ For statistical analysis, the data was first imported into Microsoft Excel and then moved to SPSS software.
- ✓ The prevalence of overuse injuries and the state of hydration were summarised using descriptive statistics.
- ✓ The association between the prevalence of overuse injuries and hydration status was investigated using inferential statistics (such as the Spearman's correlation or the Chi-square test).

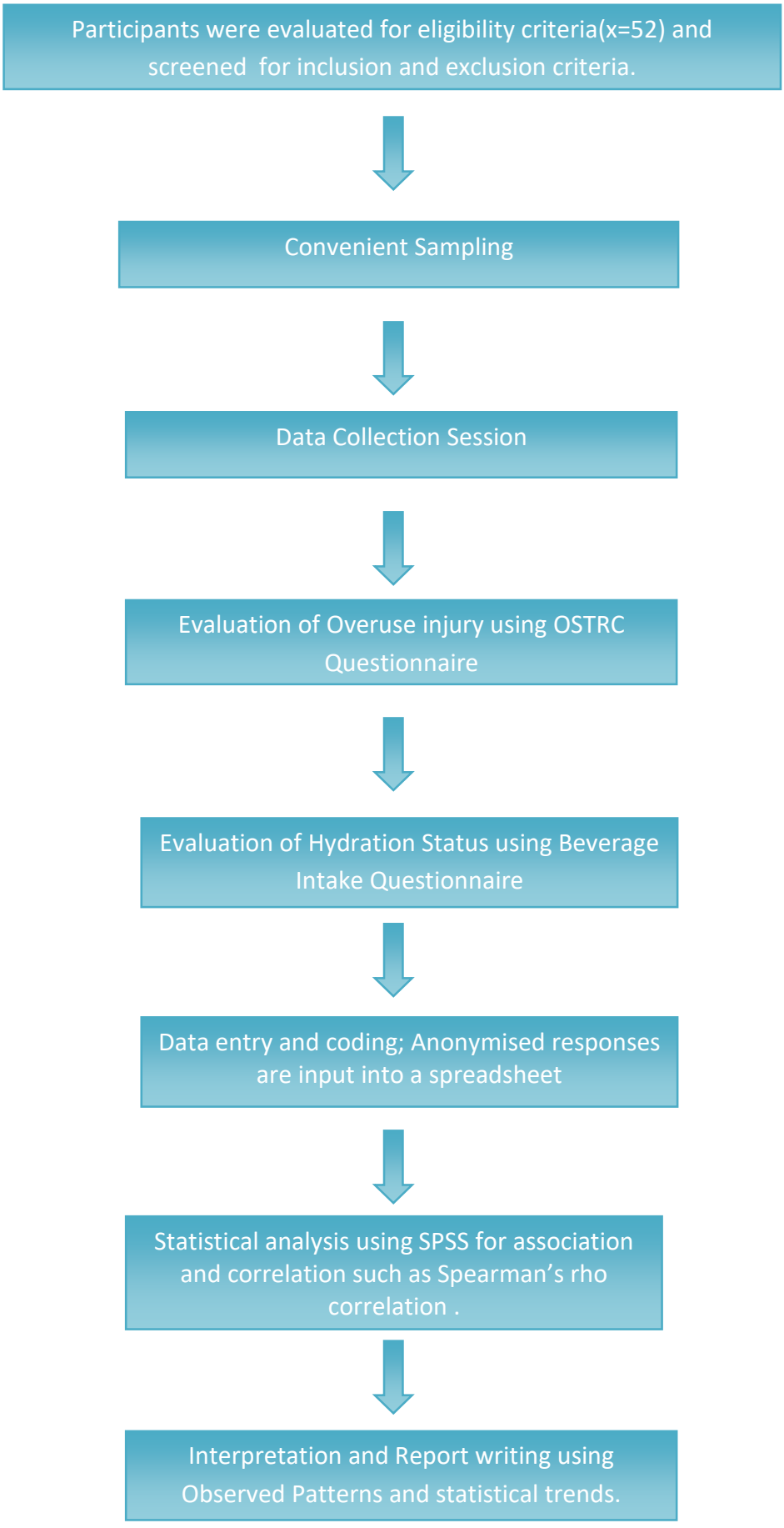


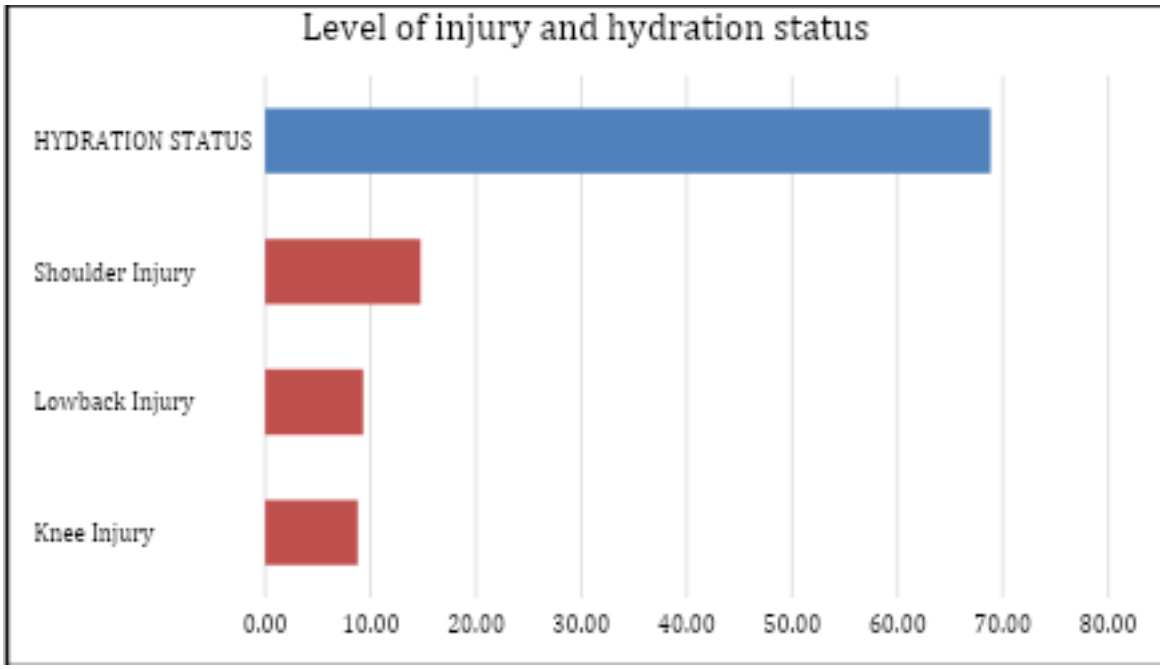
Fig 2: Schematic Representation of work plan

DATA ANALYSIS

In a cross-sectional study conducted on 51 male collegiate recreational cricket players to analyse the relationship between hydration status and its impact on overuse injuries. The hydration status was assessed using Beverage Intake Questionnaire (BIQ) and OSTRC Questionnaire was used to assess the overuse injuries which focused on knee, lower back and shoulder regions. The data is collected using these Questionnaires and the significance is assessed .

Table No. 1: Descriptive statistics of the variables taken in the study which shows mean and standard deviation

Observed variables in the study	**N**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Age	51	18	24	21.82	1.658
OSTRC_Knee	51	0	92	8.78	18.068
OSTRC_lowback	51	0	51	9.29	15.096
OSTRC_Shoulder	51	0	53	14.75	18.153
BIQ_Floz	51	0	127	68.84	25.176



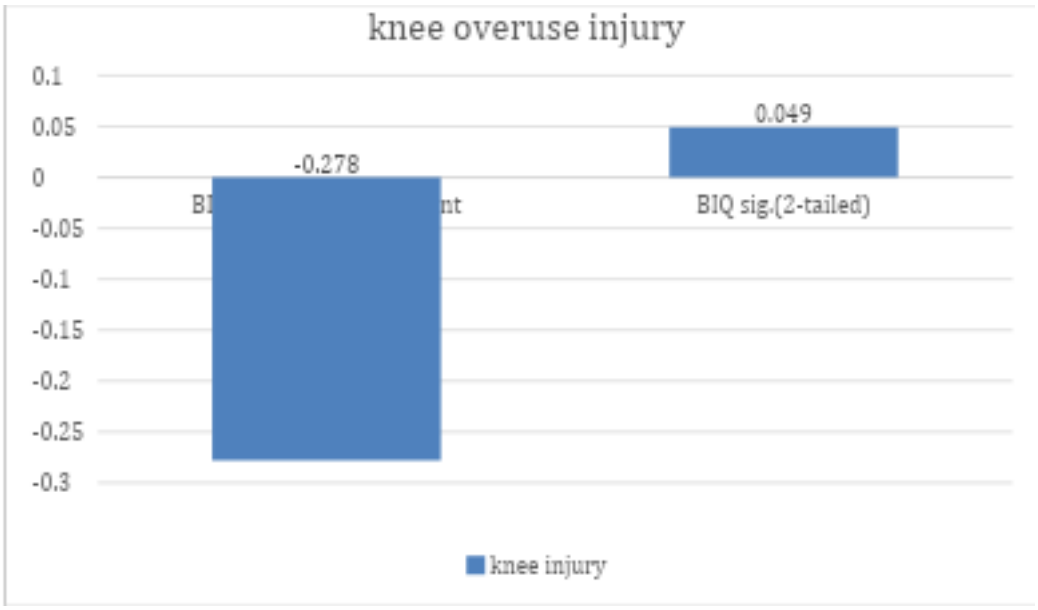
Graph 1: Showing Level of Injuries and Hydration status

Table no.2: Tests for normality, showing p-value of the variables

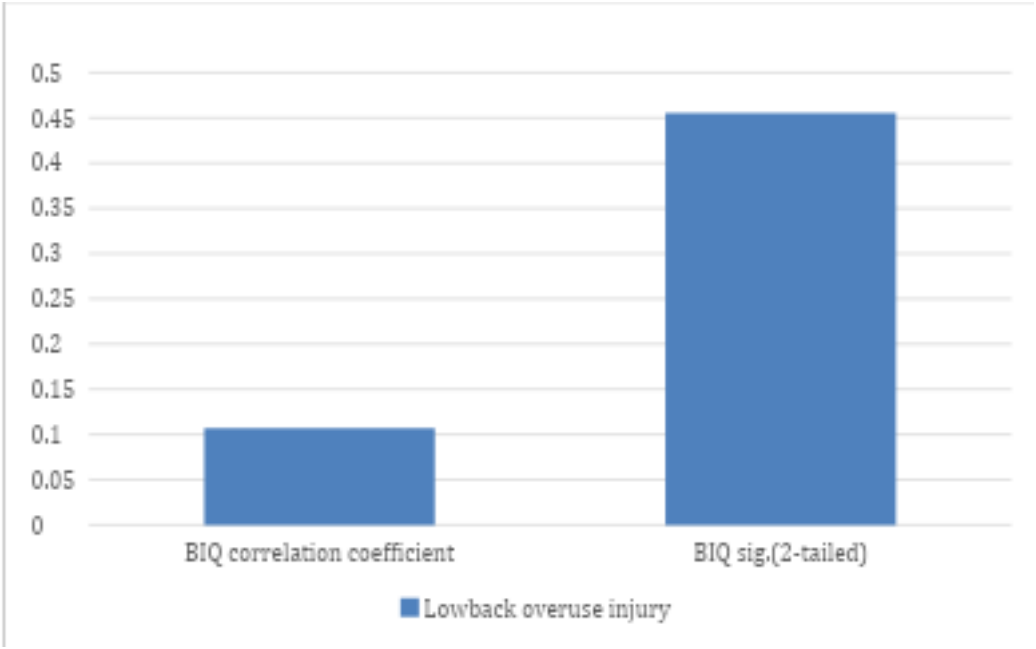
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
OSTRC_Knee	.432	51	.000	.560	51	.000
OSTRC_Lowback	.417	51	.000	.659	51	.000
OSTRC_Shoulder	.341	51	.000	.772	51	.000
BIQ_Floz	.064	51	.200*	.988	51	.880

Table No.3: Spearman's rho correlation among 51 participants

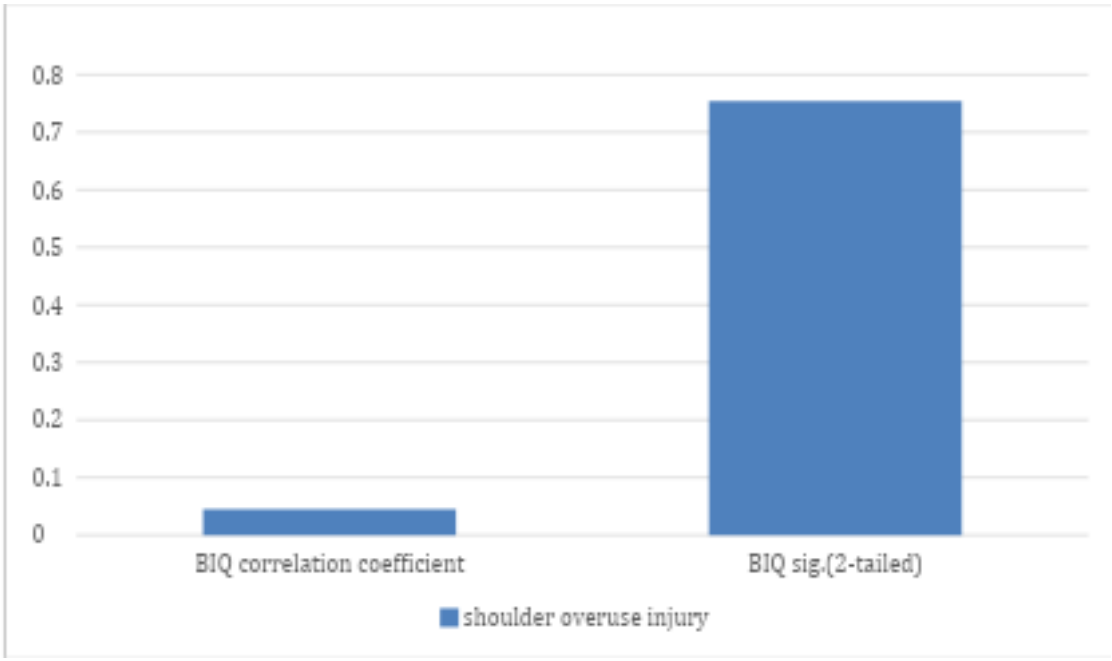
			OSTRC_Knee	OSTRC_Lowback	OSTRC_Shoulder	BIQ_Floz
Spearman's rho	OSTRC_Knee	Correlation Coefficient	1.000	-.276	-.494	-.278
		Sig. (2-tailed)		.050	.000	.049
		N	51	51	51	51
	OSTRC_Lowback	Correlation Coefficient	-.276*	1.000	-.566	.107
		Sig. (2-tailed)	.050		.000	.455
		N	51	51	51	51
	OSTRC_Shoulder	Correlation Coefficient	-.494	-.566	1.000	.045
		Sig. (2-tailed)	.000	.000		.754
		N	51	51	51	51
	BIQ_Floz	Correlation Coefficient	-.278*	.107	.045	1.000
		Sig. (2-tailed)	.049	.455	.754	
		N	51	51	51	51



Graph 2: Shows correlation coefficient and Significance between (Beverage Intake Questionnaire) and Knee overuse injuries.



Graph 3: Shows correlation coefficient and Significance between BIQ (Beverage Intake Questionnaire) and Lower back overuse Injuries.



Graph 4: Shows Correlation coefficient and significance between BIQ (Beverage Intake Questionnaire) and Shoulder overuse injuries

RESULT

The findings of Spearman's rho correlation analysis show a statistically significant but weak negative correlation ($r = -0.278$, $p = 0.049$) between knee overuse injuries and hydration status. This indicates that male collegiate recreational cricket players may experience slight decrease in knee injuries if the players drink more water. However, there was no significant association between hydration status and overuse injuries in the shoulder ($r = 0.045$, $p = 0.754$) or lower back ($r = 0.107$, $p = 0.455$), suggesting that hydration status may not be the major factor in these sites.

The Shapiro-wilk test for normality indicates that the variables OSTRC_Knee, OSTRC_Lowback, and OSTRC_Shoulder varied considerably from a normal distribution, with p values of 0.000, suggesting non-normality. In comparison, the BIQ variable had p-value of 0.880 which is greater than 0.05, indicating that it follows a normal distribution. Therefore, out of the four variables, only BIQ_Floz is normally distributed.

DISCUSSION

The present study conducted among 51 male collegiate recreational cricket players to investigate the hydration status and overuse injuries using Beverage Intake Questionnaire and OSTRC Questionnaire. The outcome of this study indicate a significant negative correlation between hydration status and knee overuse injuries ($r = -0.278$, $p = 0.049$), shows that low hydration levels were associated with higher knee injury scores and no significant correlation were observed between hydration status and shoulder or low back.

The results of earlier research that looked into hydration habits and overuse injuries individually support these conclusions. In a study of young male athletes in Beijing, **Xing Wang et al. (2023)** observed that although hydration biomarkers were similar among participants, those who drank more water were more physically active. The challenge of sustaining proper hydration in active persons was highlighted by the persistently high rate of dehydration. Similar findings were made by **Yarasheva Dilnoza (2024)**, who discovered that while

post-match hydration levels considerably improved, most female handball players were dehydrated prior to competition. These results support the idea that throughout training sessions and throughout the day, hydration levels vary, potentially influencing the risk of injury.

Several studies have consistently found a significant prevalence of overuse injuries among juvenile and collegiate athletes. **Leppänen et al. (2019)** discovered that nearly half of all soccer players sustained overuse injuries, with the knee being the most commonly afflicted anatomical location. According to **Višnjevac (2020)**, athletes aged 15 to 30 are prone to overuse problems, notably in the knee and lower back. These findings are consistent with the current study, which identified the knee as the most common site of injury, particularly among those with low hydration status.

In their investigation of the function of hydration awareness, **Judge et al. (2021)** observed that many athletes continued to use thirst as their major indicator of fluid intake, a practice known to be incorrect, despite widespread knowledge of the detrimental consequences of dehydration on performance. Even though hydration knowledge was not directly evaluated in this study, the patterns of hydration found indicate that collegiate cricket players may have comparable behavioural gaps.

The results also align with other studies on sports-related overuse injuries. Overuse injuries are chronic in nature and primarily affect the lower limbs, as highlighted by **Clarsen et al. (2014) and Roos et al. (2015)**. The fact that injuries to the knee, shoulder, and lower back are common among gym-goers—as noted by **Hetaimish (2024)**—confirms that these anatomical locations are especially vulnerable to repetitive mechanical stress. Accordingly, **Fröhlich et al. (2020)** showed that high training loads and pre-existing traumatic injuries were important causes of overuse injuries in elite alpine skiers, pointing to a complex etiology that might also involve levels of hydration.

In conclusion, while the current study did not identify a statistically significant link between hydration status and overuse injuries, the trends observed are consistent with previous findings and support the idea that dehydration may play a role in injury development. These findings emphasize the importance of promoting optimal hydration behaviours and highlight the need for additional long-term research with objective hydration biomarkers and larger sample numbers. Hydration monitoring and athlete education may be a realistic strategy to reduce the occurrence of overuse injuries and improve performance results in collegiate sports.

CONCLUSION

The study investigates the relationship between hydration status and incidence of overuse injuries among male collegiate recreational cricket players. In spite of lack of significant association ($p > 0.05$), the findings of data show a potential trend that low hydration status may influence the prevalence of overuse injuries. Although there was no clear causal link found in the data, the trend show how important is to maintain ideal hydration level for both injury prevention and general athletic performance.

These results highlight the need for recreational athletes to be more mindful of their hydration habits. Furthermore, the physiological significance of hydration in musculoskeletal health and performance justifies additional research utilizing longitudinal or experimental approaches, despite the fact that the results were not statistically significant.

LIMITATIONS

- The study conducted on small sample size as only 51 participants included this limits the statistical power to find significant relationship.
- The study was conducted only on male collegiate recreational cricket players which limits the application of the outcome result across performance and gender.
- The study conducted which includes data collection at a single point in time, limiting the relationship between variables.
- The OSTRC and Beverage Intake Questionnaires are used for the study to asses the overuse injuries and hydration status respectively. The Questionnaires are more prone to bias or inaccuracies.
- The study does not include the physical conditions (e.g., endurance, VO_2 max) which may relate to both overuse injury and hydration risk.

FUTURE RECOMMENDATIONS

- The sample size for the future studies should be larger and involving heterogeneous population, including athletes from different college, gender and regions to increase gernalization of findings.
- Future studies should involve objective biomarkers such as urine specific gravity, blood osmolarity or body weight change for the precise results.
- Assessing training duration, intensity, and recovery times along with hydration levels may assist determine the points at which athletes are susceptible to overuse injuries.
- Future research should look into fluid consumption patterns throughout the day, including pre-, intra-, and post-training hydration, to identify important periods of dehydration risk.
- Creating and evaluating the efficacy of hydration education programs tailored to recreational athletes can raise awareness and lead to behavioural changes that minimize injury risk

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ANNEXURE 1

DEPARTMENT OF PHYSIOTHERAPY

TEERTHANKER MAHAVEER UNIVERSITY Delhi

Road, Moradabad – 244001

INFORMED CONSENT FORM

Study Title: Analysis of Hydration status and its impact on overuse injuries among male collegiate recreational cricket players: a cross-sectional study.

Study Number-

Aim of Research: The purpose of the study is to examine the hydration status of male collegiate recreational cricket players and assess how they relate to the incidence of overuse injuries. The study aims to evaluate how hydration affects both injury prevention and overall sports performance by exploring hydration levels and their relationship to injury prevalence.

Subject's Full Name:

1. I confirm that I have read and understood the information sheet dated _____for the above Study and have had the opportunity to ask questions or I have been explained to the nature of the study by the Investigator and had the opportunity to ask questions.

2. I understand that my participation in the study is voluntary, and I am free to withdraw at any time, without Giving any reason and without my medical care of legal right being affected.

3. I understand that the sponsor of the clinical trial/project, other working on the Sponsor's behalf, the ethical Committee and the regulatory authorities will not need my permission to look at my health record both in respect of the current study and any further research that may be conducted in relation to it, even if I Withdraw from the trial. However, I understand that my Identity will not be revealed in any information released to third parties or published.

4. I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purposes.

5. I agree to take part in the above study.

Signature (or Thumb impression) of the Subject/Legally Acceptable Representative:

_____

Signatory's Name_____

Date_____

Signature of Investigator _____

Date_____

Study Investigator's Name: -

Signature & name of the Witness_____

Date_____

ANNEXURE 2

Oslo Sports Trauma
RESEARCH CENTER

OSTRC Overuse Injury Questionnaire

Part 1: Knee Problems

Please answer all questions regardless of whether or not you have problems with your knees. Select the alternative that is most appropriate for you, and in the case that you are unsure, try to give an answer as best you can anyway.

The term "knee problems" refers to pain, ache, stiffness, swelling, instability/giving way, locking or other complaints related to one or both knees.

Question 1

Have you had any difficulties participating in normal training and competition due to knee problems during the past week?

- ☐ Full participation without knee problems
- ☐ Full participation, but with knee problems
- ☐ Reduced participation due to knee problems
- ☐ Cannot participate due to knee problems

Question 2

To what extent have you reduced you training volume due to knee problems during the past week?

- ☐ No reduction
- ☐ To a minor extent
- ☐ To a moderate extent
- ☐ To a major extent
- ☐ Cannot participate at all

Question 3

To what extent have knee problems affected your performance during the past week?

- ☐ No effect
- ☐ To a minor extent
- ☐ To a moderate extent
- ☐ To a major extent
- ☐ Cannot participate at all

Question 4

To what extent have you experienced knee pain related to your sport during the past week?

- ☐ No pain
- ☐ Mild pain
- ☐ Moderate pain
- ☐ Severe pain

ANNEXURE 3

Oslo Sports Trauma
RESEARCH CENTER

OSTRC Overuse Injury Questionnaire

Part 2: Lower Back Problems

Please answer all questions regardless of whether or not you have problems in your lower back. Select the alternative that is most appropriate for you, and in the case that you are unsure, try to give an answer as best you can anyway.

The term "lower back problems" refers to pain, aching, stiffness or other problems in your lower back.

Question 1

Have you had any difficulties participating in normal training and competition due to lower back problems during the past week?

- ☐ Full participation without lower back problems
- ☐ Full participation, but with lower back problems
- ☐ Reduced participation due to lower back problems
- ☐ Cannot participate due to lower back problems

Question 2

To what extent have you reduced you training volume due to lower back problems during the past week?

- ☐ No reduction
- ☐ To a minor extent
- ☐ To a moderate extent
- ☐ To a major extent
- ☐ Cannot participate at all

Question 3

To what extent have lower back problems affected your performance during the past week?

- ☐ No effect
- ☐ To a minor extent
- ☐ To a moderate extent
- ☐ To a major extent
- ☐ Cannot participate at all

Question 4

To what extent have you experienced lower back pain related to your sport during the past week?

- ☐ No pain
- ☐ Mild pain
- ☐ Moderate pain
- ☐ Severe pain

ANNEXURE 4

Oslo Sports Trauma
RESEARCH CENTER

OSTRC Overuse Injury Questionnaire

Part 3: Shoulder Problems

Please answer all questions regardless of whether or not you have problems in your shoulders. Select the alternative that is most appropriate for you, and in the case that you are unsure, try to give an answer as best you can anyway.

The term "shoulder problems" refers to pain, aching, stiffness, looseness or other complaints in one or both of your shoulders.

Question 1

Have you had any difficulties participating in normal training and competition due to shoulder problems during the past week?

- ☐ Full participation without shoulder problems
- ☐ Full participation, but with shoulder problems
- ☐ Reduced participation due to shoulder problems
- ☐ Cannot participate due to shoulder problems

Question 2

To what extent have you reduced you training volume due to shoulder problems during the past week?

- ☐ No reduction
- ☐ To a minor extent
- ☐ To a moderate extent
- ☐ To a major extent
- ☐ Cannot participate at all

Question 3

To what extent have shoulder problems affected your performance during the past week?

- ☐ No effect
- ☐ To a minor extent
- ☐ To a moderate extent
- ☐ To a major extent
- ☐ Cannot participate at all

Question 4

To what extent have you experienced shoulder pain related to your sport during the past week?

- ☐ No pain
- ☐ Mild pain
- ☐ Moderate pain
- ☐ Severe pain

ANNEXURE 5

Beverage Questionnaire

Instructions:
In the past month, please indicate your response for each beverage type by marking an "X" in the bubble for "how often" and "how much each time"
1) Indicate how often you drank the following beverages, for example, you drank 5 glasses of water per week, therefore mark 4-6 times per week
2) Indicate the approximate amount of beverage you drank each time, for example, you drank 1 cup of water 2 times per day, therefore mark 1 cup under "how much each time"

Subject ID _____

Date _____

	HOW OFTEN (MARK ONE)							HOW MUCH EACH TIME (MARK ONE)				
Type of Beverage	**Never or less than 1 time per week (go to next beverage)**	**1 time per week**	**2-3 times per week**	**4-6 times per week**	**1 time per day**	**2+ times per day**	**3+ times per day**	**Less than 6 fl oz (3/4 cup)**	**8 fl oz (1 cup)**	**12 fl oz (1 1/2 cups)**	**16 fl oz (2 cups)**	**More than 20 fl oz (2 1/2 cups)**
Water	O	O	O	O	O	O	O	O	O	O	O	O
100% Fruit Juice	O	O	O	O	O	O	O	O	O	O	O	O
Sweetened Juice Beverage/Drink (fruit ades, lemonade, punch, Sunny Delight[a])	O	O	O	O	O	O	O	O	O	O	O	O
100% Vegetable Juice (V8[b], etc.)	O	O	O	O	O	O	O	O	O	O	O	O
Whole Milk	O	O	O	O	O	O	O	O	O	O	O	O
Reduced Fat Milk (2%)	O	O	O	O	O	O	O	O	O	O	O	O
Low Fat/Fat Free Milk (Skim, 1%, Buttermilk, Soymilk)	O	O	O	O	O	O	O	O	O	O	O	O
Soft Drinks, Regular	O	O	O	O	O	O	O	O	O	O	O	O
Diet Soft Drinks/Artificially Sweetened Drinks (Crystal Light[c])	O	O	O	O	O	O	O	O	O	O	O	O
Sweetened Tea	O	O	O	O	O	O	O	O	O	O	O	O
Coffee, with cream and/or sugar (includes non-dairy creamer)	O	O	O	O	O	O	O	O	O	O	O	O
Tea or Coffee, black, with/ without artificial sweetener (no cream or sugar)	O	O	O	O	O	O	O	O	O	O	O	O
Non-alcoholic or Light Beer	O	O	O	O	O	O	O	O	O	O	O	O
Beer, Ales, Wine Coolers	O	O	O	O	O	O	O	O	O	O	O	O
Hard Liquor (shots, rum, tequila, etc.)	O	O	O	O	O	O	O	O	O	O	O	O
Mixed Alcoholic Drinks (daiquiris, margaritas, etc.)	O	O	O	O	O	O	O	O	O	O	O	O
Wine (red or white)	O	O	O	O	O	O	O	O	O	O	O	O
Meal Replacement Shakes/Protein Drinks (Slimfast[d], shakes, etc.)	O	O	O	O	O	O	O	O	O	O	O	O
Energy Drinks (Red Bull[e], Rockstar[f], Full Throttle[g], etc.)	O	O	O	O	O	O	O	O	O	O	O	O
Other (list):	O	O	O	O	O	O	O	O	O	O	O	O
Other (list):	O	O	O	O	O	O	O	O	O	O	O	O

Virginia Polytechnic Institute and State University, 2008

ANNEXURE 6

TEERTHANKER MAHAVEER UNIVERSITY
DEPARTMENT OF PHYSIOTHERAPY
(Established under Govt. of U.P. Act No. 30, 2008)
Tel.:+91-2360222, 2360777 · Fax: +91-591-2360077, 2487444, 2360444
Email: principal.physiotherapy@tmu.ac.in; Website: www.tmu.ac.in

Ref: -TMU/PT/2024-25/190 **Date: 05/05/2025**

To Whomsoever it May Concern

This is to certify that the under mentioned **BPT 4th year** students have undertaken a project work titled **"Analysis of Hydration Status and its impact on overuse injuries among male collegiate recreational cricket players: a cross sectorial study"** for partial fulfillment of requirement of the degree of BPT.
Kindly, allow them to collect the data for the same.

BPT 4th year Students:

1-Mr.Mohd Sunny (TPT2103053)
2-Mr.Mohd Suhail (TPT2103052)
3-Mr.Mohd Zubair (TPT2103054)

05/05/25

Guide Name – Ms. Neelam Chauhan

Shivanee M Kaul
Head
Department of. Physiotherapy

ANNEXURE 7

MASTERCHART

S.No	Age	OSTRC Knee(O1)	OSTRC Low Back(O2)	OSTRC Shoulder(O2)	BIQ (fl oz)
1	22	0	20	0	127
2	20	0	0	28	74
3	23	0	20	0	88
4	23	0	0	28	58
5	23	0	0	37	58
6	21	44	0	0	78.3
7	23	28	0	0	84
8	22	0	0	38	104
9	22	0	22	0	57.6
10	22	42	0	0	58
11	19	92	0	0	48
12	20	22	51	0	44
13	19	0	28	0	81
14	20	0	0	47	90
15	23	28	0	0	30
16	21	51	0	0	45.2
17	23	28	0	0	57.6
18	22	0	0	51	84.1
19	20	0	28	0	68.4
20	22	0	0	35	44.7
21	18	20	0	0	99.9
22	20	28	0	0	59.2
23	23	0	51	0	68.2
24	23	0	0	20	47
25	22	17	0	0	30
26	23	0	28	0	89.5
27	20	20	0	0	88
28	21	0	0	28	61.9
29	18	0	28	0	69.5
30	22	0	0	16	89.6
31	24	0	28	0	89.1
32	22	0	0	22	121.6
33	21	0	22	0	66.24

34	24	28	0	0	34.7
35	22	0	0	28	91.7
36	22	0	37	0	105
37	20	0	0	51	56
38	24	0	0	37	0
39	22	0	0	16	38.7
40	23	0	28	0	43.9
41	23	0	25	0	111.1
42	24	0	0	44	56.8
43	24	0	14	0	73.1
44	23	0	44	0	37.2
45	24	0	0	28	82.9
46	22	0	0	44	90.6
47	24	0	0	35	77.4
48	22	0	0	16	73.1
49	19	0	0	28	46.3
50	24	0	0	53	61.6
51	20	0	0	22	70.9