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Original Research Article

Musculoskeletal Injury and Associated Factors in South Gondar Zone Volleyball Players, Ethiopia

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ABSTRACT

A retrospective study in the South Gondar zone of Amhara, Ethiopia, during 2021/2022 aimed to investigate the prevalence and associated factors of musculoskeletal injuries among the region's burgeoning population of volleyball players, who are noted to be highly vulnerable due to insufficient protective equipment, unsuitable playing areas, and inadequate medical facilities. The study involved a total of 360 volleyball players (195 from projects and 165 from clubs), with an overall mean age of *18.54±3.27* years, though club players were significantly older (*20.34±2.78* years) than project players (*15.42±1.92* years). Over the study period, the sample reported 62 total injuries, indicating that the frequency of injury was high, even though *82.78%* of the players did not sustain an injury. Club players accounted for a slightly higher rate of injuries (54.84% or 34/62) compared to project players (45.16% or 28/62), but statistical analysis showed no significant difference between the two groups (*p=0.1194*). Crucially, the overall risk of injury was significantly higher during match play than during training, with a probability of injury at *12.78%* during matches versus *4.44%* during training. This meant players were about *2.9* times more likely to be injured during a match than during training (*p=0.0002*). According to physician diagnoses, the most frequent sites of injury were the ankles (56.45% or 35/62) and fingers (22.58% or 14/62), followed by the shoulder (8.06%), thumb (6.54%), and both the knee and Achilles tendon (3.23% each), underscoring the specific high-risk body parts for this population and concluding that targeted interventions are urgently needed to mitigate the high injury rates, particularly by focusing on match-day safety and common injury sites.

Keywords: Causes, Injuries, Prevalence, Trainees, Volleyball.

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INTRODUCTION

Volleyball is recognized as one of the world's five largest international sports, boasting an estimated 800 million weekly participants across 220 affiliated national federations (Gouttebarge, 2017). Uniquely, it is the only ball game featured in both the modern Olympic and Paralympic Games. The sport has two main competitive formats: the traditional indoor version played with six players per team, and beach volleyball, which is an outdoor game typically played on sand with two players per team (Desalegn et al., 2016).

Recognized worldwide for its exciting speed and dynamic play, volleyball is a truly popular sport (Desalegn et al., 2016). Although engaging in volleyball provides clear advantages for a participant's physical health, mental state, and social life, this sport is not without hazard; it carries an inherent risk of musculoskeletal injuries.

Research conducted across various countries indicates that the prevalence of musculoskeletal injuries in volleyball is a consistent issue, affecting players regardless of differences in weight, height, sex, or age group. For example, Gouttebarge (2017) found that the incidence of these injuries in volleyball players generally ranges from 1.7 to 10.7 per 1,000 playing hours, with higher rates observed during matches and predominantly among male players.

Due to the nature of volleyball, which requires repetitive overhead movements like spiking and blocking, players are susceptible to overuse injuries primarily affecting the shoulder, as well as other injuries resulting from various game movements (Bere et al., 2015).

Desalegn et al. (2016) noted a recent increase in volleyball participation in Ethiopia across clubs, projects, and recreational programs. However, this growth is accompanied by significant risks: Ethiopian athletes are highly vulnerable to injuries due to a systemic lack of protective equipment, suitable playing surfaces, medical facilities, effective injury surveillance, and skilled manpower (including coaches). Given this vulnerability, more research on volleyball players is essential to better control injury occurrence. Consequently, stakeholders like coaches and sports commission experts in Ethiopia must be informed about the risk factors and preventive mechanisms for musculoskeletal injuries to ensure better follow-up and management of athletes.

Consequently, this research was designed to document and analyze various aspects of musculoskeletal injuries in male volleyball players from South Gondar zone projects and Woreda clubs. Specifically, it recorded the prevalence, nature (type), seriousness (severity), location on the body, cause, and prevention strategies related to these injuries, along with identifying the court position of the injured players.

MATERIALS AND METHODS

This quantitative research utilized a retrospective cohort study design to investigate volleyball players. The source population for the study was drawn from the South Gondar Zone, specifically including both the administrative cities' and Woredas' volleyball projects and clubs.

According to a Q2 2022 report from the zone, the region contains 48 volleyball projects spanning various age categories and both sexes (U-13, U-15, and U-17), alongside 17 established volleyball clubs

Data Collection Instrument, Procedure and Definition

To execute this study, the investigators developed a structured, interviewer-administered questionnaire and exposure forms, drawing content from a review of existing literature. This

instrument was the primary tool for data collection. The questionnaire was divided into two sections: Part One gathered participants' demographic profiles, while Part Two focused on their injury profiles. Within the injury section, participants reported details for each injury, including whether it occurred during a training session or a competition. The questionnaire was provided in both English and Amharic (the local language) to accommodate participants' varied educational backgrounds. For the purpose of this study, an injury was defined as, any incident that occurs during warm up or competition that requires medical attention (Zemper & Piter, 1989) and cause the player to be out from sport participation either in training or match session (McKay et al.,2001). A pre-existing before the tournament and not fully rehabilitated injury was not reported or registered.

Statistical Methods

The descriptive information regarding the injuries was gathered directly from the interviewer-administered questionnaires. For analysis, categorical data (like injury type or location) was presented using incidence tables, while continuous data (such as age or severity scores) was summarized using means and standard deviations (SD).

Injury prevalence was determined by calculating the total number of reported injuries relative to the overall number of leisure-time runners. To examine the association between explanatory factors and the dependent variable (injury), the study utilized the Adjusted Odds Ratio (AOR) and Relative Risk (RR), with statistical significance set at a p-value of less than 0.05 and reported with a 95% confidence interval.

RESULTS

Participants

A total of 360 volleyball players (165 from clubs and 195 from projects) completed the study questionnaires out of 374 expected participants, yielding a high 96.3% response rate. The final participant distribution, shown in Figure 4.1, included 45.8% club players and 54.2% project players. Club players had a slightly better response rate at 97.1% (165/170) compared to project players at 95.6% (195/204).

Table 1: Socio-demographic characteristics of the participants.

Variable	Club	Project	Total
	Mean ± SD*	Mean ± SD	Mean ± SD
Body mass	67.04±4.53	53.15±6.51	56.42±3.27
Stature (cm)	180.77±4.24	167.15±6.23	169.44±7.8
Age (years)	20.34±2.78	15.42±1.92	18.54±2.81
playing experience (years)	4.38±2.38	1.91±0.77	2.33±1.51
Training hours per week (hours)	10.75±3.32	7.68±1.41	8.73±2.83
Frequency of training per week (Sessions)	4.0±0	3.0±0	3.5±0

*SD-Standard Deviation

The volleyball players in the study had an average age of 18.54±3.27 years, weighed 56.42±8.27 kg, and stood 169.44±7.8 cm tall. However, players differed significantly by team type: club players were older (20.34±2.78 years), taller (180.77±4.24 cm), and heavier (67.04±4.53 kg) than project players (15.42±1.92 years, 167.15±6.23 cm, and 53.15±6.51 kg, respectively). This difference in maturity was mirrored in their training load: club players trained four sessions per week for 10.75±3.32 hours, reflecting 4.38±2.38 years of experience, while project players trained three sessions for 7.68±1.41 hours per week, with only 1.91±0.77 years of experience.

Prevalence of Injuries in the Season

During the four-month study period (October 2021 to February 2022), 62 total injuries were recorded, translating to an injury prevalence of 0.17 per player. While 82.78% (298 players) remained injury-free, 17.22% of the 360 participants did sustain an injury. Looking at the distribution of the 62 injuries, club players were responsible for 54.84% (34 injuries), slightly more than the 45.16% (28 injuries) reported by project players.

The study found that club players appeared to have 1.548 times the odds of injury compared to project players. However, this apparent difference was not statistically significant ($p=0.119$ which is greater than 0.05). Therefore, based on the Adjusted Odds Ratio (AOR) and its wide 95% confidence interval (0.893 to 2.683), the injury rates between project and club participants were considered comparable.

When comparing the likelihood of injury, club players faced a probability of 20.6% (34/165), while project players had a lower probability of 14.36% (28/195). This made club players 1.4 times more likely to be injured (Relative Risk, RR=1.435). However, this difference was not statistically significant ($p=0.12$), meaning the 95% confidence interval (0.910 to 2.262) confirmed no definitive risk difference between the two groups

Injury Occurrences in Relation to Team Type

A clear majority of the 62 reported injuries (74.19% or 46 injuries) occurred during match play, compared to just 25.81% (16 injuries) during team training. The analysis showed a statistically significant difference ($p<0.0002$), concluding that the overall risk of injury was higher for match play than for training. Specifically, the probability of injury was 12.78% during a match versus 4.44% during training. This translates to a Relative Risk (RR) of 2.875, meaning players were nearly three times (2.9 times) more likely to be injured during a match than during a training session. The odds of an injury occurring during a match were also significantly greater (Odd Ratio, OR=3.1497).

Table 2: The rate of injurie in terms of body part.

Injury Exposure	Body Part	Knee	Ankle	Thumb	Achilles Tendon	Finger	Shoulder	Total
	Frequency	2	35	4	2	14	5	62
	Percentage	3.23	56.5	6.5	3.2	22.6	8.1	100

Based on the 62 total reported injuries, the most common anatomical sites were overwhelmingly the ankles (56.45% or 35 injuries) and fingers (22.58% or 14 injuries). Combined, these two areas accounted for nearly 80% of all injuries. The remaining injuries were distributed

across the shoulder (8.06% or 5 injuries), thumb (6.54% or 4 injuries), and the knee and Achilles tendon, both of which accounted for 3.23% (2 injuries each).

The Injured Anatomical Site

The majority of injuries in the study were sustained in the lower extremities (62.9% or 39/62), compared to 37.1% (23/62) in the upper limbs. This difference was statistically significant (p=0.0045). The analysis showed that the rate of injury in the lower extremities was higher, with an Adjusted Odds Ratio (AOR) of 2.88. This means that players had nearly three times the odds of sustaining a lower-extremity injury compared to an upper-extremity injury during the season

Table 3: Rate and diagnose of injury related to team type.

Type of Injuries Diagnosed	Club	%	Project	%	Total	%
Bursitis	1	1.61	0	0	1	1.61
Muscle Cramp	3	4.84	0	0	3	4.84
Tendonitis	0	0	2	3.22	2	3.22
Sprain	1	1.61	0	0	1	1.61
Strain	13	20.97	16	25.81	29	46.78
Total	34	55.84	28	45.16	62	100

The analysis of injury types revealed that strains were the dominant diagnosis, accounting for 46.78% (n=29) of all cases. Dislocations (involving the ankle, finger, and knee) were the next most common, followed by minor percentages of muscular cramps (4.84%, n=3), tendonitis (3.22%, n=2), and rare cases of sprains and bursitis (both 1.61%, n=1). Team type influenced the primary injury: club players were most susceptible to dislocations (47.06% of their total), while project players were most exposed to strains (57.14% of their total).

The Type of Injuries Diagnosed in Terms of Body Part

The study found that strain (46.8%) and dislocation (41.9%) were the two most frequent types of injuries overall. When linking these types to specific body parts, ankle dislocation (33.9%) and ankle strain (22.6%) were particularly high, collectively dominating the injury profile. Interestingly, while the ankle was highly prone to dislocation, the fingers were more susceptible to strain (19.3%) than the ankle (3.2%). Less common injury patterns included tendinitis (4.8%) and muscular cramps (3.2%), with specific cases noted in the knees (3.2% each). Finally, 3.2% of all injuries involved Achilles tendon tendinitis and the same percentage involved hamstring cramps.

Injury Related to situation of Playing

The primary risk activities for both teams were blocking (52.94% of club injuries; 50% of project injuries) and setting (20.59% of club injuries; 39.29% of project injuries). Spiking accounted for 17.65% of club injuries and 7.14% of project injuries, with sprawling and serve receiving accounting for the rest

Crucially, the study found a significant disparity in injury risk based on court position (p=0.0027). Players in the attacking zone (frontline) had a 93.5% probability of injury versus 6.5% for back court players, making them five times more likely to be injured (RR=5.0). Furthermore,

players in the left and right front-row were significantly more prone to injuries during the act of blocking (p=0.006).

Table 4: factors of injury in terms team type.

Injury Factor	Step on other's foot	Ball Contact	Wrong Technique	Total
Frequency	14	7	13	34
Club (%)	22.58	11.29	20.97	54.84
Frequency	22	12	28	62
Frequency	8	5	15	28
Project (%)	12.9	8.06	24.19	45.15

The primary cause of injuries for both groups was incorrect technique execution, responsible for over half of all injuries among project players (53.57%, 15/28), and 38.24% (13/34) of injuries among club players. The second major cause for club players was landing by stepping on another person's foot (41.17%, 14/34), which affected a smaller proportion of project players (28.57%, 8/28). Finally, ball contact accounted for the remaining injuries: 20.59% for clubs and 17.86% for projects.(Table:4)

Injury Classification

The vast majority of the 62 total injuries sustained during the season were acute (91.93% or 57 injuries), with only 8.07% (5 injuries) classified as overuse injuries. Of the acute injuries, club players sustained a higher proportion (50% or 31/62) than project players (41.93% or 26/62). While club players showed a slightly higher probability of acute injury (18.79% vs. 14.36% for projects), statistical analysis confirmed no significant difference in the rate of acute injuries between the two teams (p=0.3681; Relative Risk [RR] of 1.4091 with p=0.1599). Similarly, overuse injuries were infrequent, with clubs having 4.84% (3/62) and projects having 3.23% (2/62).

Injuries in Terms of Players Court Position

Based on the analysis of 62 total injuries sustained by the volleyball players, the injury profile was overwhelmingly acute (91.93%), with only 8.07% classified as overuse injuries. Although club players had a higher percentage of acute injuries (50% or 31/62) compared to project players (41.93% or 26/62), the difference in the rate of acute injuries between the two team types was found to be not statistically significant (p>0.15), confirmed by a Relative Risk (RR) of 1.4091 for clubs. The distribution of these injuries varied significantly by court position: the majority of incidents for both teams occurred in the front row (left and right hitting positions), which accounted for 47.06% of club injuries and 35.71% of project injuries. Setters were a particularly high-risk group for project players (32.14%), while only a small percentage of injuries occurred in the back row for either team.

DISCUSSION

The demographic profile of the players in the current study—including age, height, weight, playing experience, and weekly training hours—was generally lower than that reported in related international studies, such as those by Beneka et al. (2007), Zetou et al. (2006) on Greek national

and local divisions, and Tsigganos et al. (2007), all of which found higher mean values for height, weight, and overall prevalence of 17.22% of players sustaining injuries during the season was higher than a previous finding by Schafle et al. (1990) but was almost identical to the 17.22% reported by Augustsson et al. (2006).

The 17.22% injury prevalence observed over the season in this study fell between the rates reported in previous research, being lower than the 43% found by Bahr & Reeser (2003) but higher than the 10% documented by Schafle (1990). Consistent with international literature (Beneka et al., 2009; Augustsson et al., 2005; Bahr, 1997), ankle and finger injuries were the most common.

In line with Aagaard and Jorgenson (1996), most injuries during both training and games were minor, although major or severe injuries are typically associated with game-time exertion. The finding that 74.19% of injuries occurred during matches (higher than training sessions) aligns with Bahr & Bahr (1997), who also indicated a rise during competition, in contrast to Augustsson et al. (2006), who noted high training injury prevalence. The elevated risk during matches is often attributed to the increased intensity and overexertion of competitive play (Agele et al., 2007; Augustsson et al., 2006).

Finally, the high rate of ankle injuries during both training and games corroborates multiple studies (Augustsson et al., 2006), reinforcing the conclusion that an ankle sprain is the most frequent acute injury in volleyball (Reeser et al., 2006; Nelson et al., 2007).

In this study, only 8.1% of players reported injuries with a gradual onset where they couldn't specify a time or event. This figure is significantly lower than the 41% found by Augustsson et al. (2006), a difference likely linked to the lower number of weekly training hours reported by the participants here compared to those in the Augustsson study. The finding aligns with research suggesting that increased training hours lead to a progressive rise in injuries. Furthermore, most injuries in this study were not caused by player-to-player collisions, a result consistent with Briner & Kamcar (1997), who found that the majority of volleyball injuries are non-contact. However, an exception to this non-contact trend was seen in the common ankle injuries: 45.16% of these specific injuries resulted from players stepping on another person's foot near the net or centerline, supporting Agel et al.'s (2007) assertion that contact is the primary cause for many ankle injuries.

CONCLUSION

The study concludes that the overall injury rate among South Gondar volleyball players is high, with 17.22% of athletes sustaining an injury. While the prevalence and risk of injury were higher among club players, the most common injuries involved the ankle and fingers. Significantly, the majority of ankle injuries resulted from contact with other players at the centerline during actions like blocking and spiking. The risk of injury is concentrated in the left and right front-row players, who are especially vulnerable during blocking in the conflict zone. Conversely, shoulder injuries, typically caused by overuse, were found to be relatively low.

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