



UNIVERSITY OF NAIROBI

**PREVALENCE, RISK FACTORS AND PATTERN OF INJURIES AMONG THE
VOLLEYBALL PLAYERS IN THE KENYA VOLLEYBALL FEDERATION
LEAGUE: A SEASON'S REVIEW.**

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H58/11349/2018

This dissertation is submitted in partial fulfillment of the requirement for the award of the degree of Masters of Medicine in Orthopaedic Surgery at the University of Nairobi

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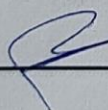
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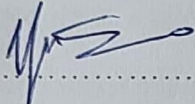
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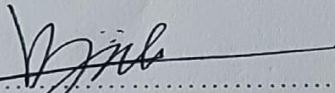
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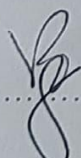
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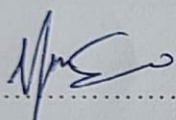
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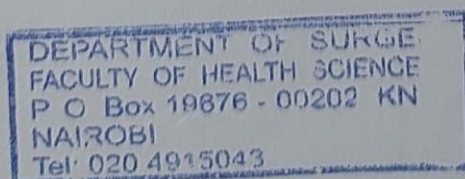
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DEDICATION

I would like to dedicate this thesis to three significant individuals in my life. Firstly, to my mother, Mrs. Amina Dulo, for her unwavering love and continuous encouragement.

Secondly, to my wife, Mrs. Muslima Abdi, who has been my steadfast companion, my closest confidant, and my greatest source of inspiration. And finally, to my brother, Mr. Mohamed Ibrahim, for his unwavering support throughout this journey.

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COLLABORATING INSTITUTIONS

Kenya Volleyball Federation (KVF)

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LIST OF ABBREVIATIONS

AI – Ankle Injury

AS- Ankle Sprain

CAVB - Confédération Africaine de Volleyball

COVID-19 – Corona Virus Disease 2019

ERC – Ethics and Research Council

FIVB- Fédération Internationale de Volleyball

KNH – Kenyatta National and Referral Hospital

KVF- Kenya Volleyball Federation

NCAA - National Collegiate Athletic Association

SPSS - Statistical Package for Social Sciences

UON – University of Nairobi

USAV- United States of America Volleyball

YMCA – Young Men Christian Association

DEFINITION OF TERMS

Volleyball – A game played by two teams, usually of six players on a side, in which the players use their hands to bat a ball back and forth over a high net, trying to make the ball touch the court within the opponents' playing area before it can be returned.

Volleyball Injury – This is any condition for which an athlete seeks medical attention.

Injuries so defined may in turn be further subdivided into conditions that result in “time lost” from either competition or training and those that do not limit playing time.

Dig - An underarm pass made with the forearms.

Set - An overhead pass made with the hands.

Spike - The overhead attacking shot.

Rally - This is the actions that take place once the ball is deemed “in play” where both teams compete to earn the point.

Amateur- A person who engages in a pursuit, especially a sport, on an unpaid rather than a professional basis

Professional - A person engaged in a specified activity as one's main paid occupation rather than as a pastime.

ABSTRACT

Background: Volleyball is a popular sport and injuries are relatively common. Past research has consistently indicated a high prevalence of injuries in volleyball. Player demographic characteristics and various other factors have been found to increase the risk of injuries. These injuries result in significant time loss and economic consequences. Therefore, it is crucial to identify the factors that make players more susceptible to injuries to develop an effective preventive strategy.

Objective: To determine the prevalence, risk factors and pattern of injuries among volleyball players in the Kenya Volleyball Federation league during a season (2021/2022).

Design and Setting: Descriptive cross-sectional study was carried out at Nyayo stadium training grounds of selected volleyball teams.

Participants and Methods: 25 Volleyball teams (166 players). 16 male teams (104) and 9 female teams (62). Proportionate sampling method was used. A structured interviewer administered questionnaire used to collect data from eligible participants.

Data analysis: SPSS version 25 was used and statistical test was performed at a 95% level of significance.

Results: 56 injuries reported among 166 athletes. Injury prevalence was 33.7% (34.6% Male, 32.2% Female). More injuries occurred during game (69.5%, n= 39) than during training (30.5%, n=17). Blocking (50.9% p<0.001), spiking (31.4% p<0.001), setting (11.8% p<0.001) were more likely to lead to injury. Most injuries sustained by players in the centre front (35.7%), right front (21.4%) and left front (19.6%) positions. Ankle (48.2%), knee (32.1%) and shoulder (23.2%) were anatomical regions most injured. Sprain (44.6%) was the commonest type of injury followed by muscle injury (30.4%). History of previous ankle

injury (OR: 2.17, CI 95%: 1.41–3.39). Strength training and skill drills (OR: 2.1 CI 95%: 1.0 – 4.0). Demographic characteristics ($p>0.237$), use of protective gears like knee brace (OR: 7.4 CI 95%:0.5 – 398), play surface and the duration of playing volleyball did not have a significant association with the occurrence of injuries.

Conclusion: The study showed high injury prevalence. Front row court positions, situations like blocking, spiking and setting as well as match period are likely to lead to injury. Ankle is the commonest body region injured and sprain is the commonest type of injury. History of previous ankle injury was significantly associated with repeat injuries. Use of strength and skill drills during training was associated with lower risk of injury.

Recommendation: We recommend that the players engage more in strength and skill drills, particularly the players in the front row. Additionally, there is a need for further prospective research to evaluate the effectiveness of prevention strategies. It is also essential to investigate the long-term impacts of injuries.

1.0 INTRODUCTION

1.1 Background

Volleyball is one of the most popular ball games in the world, with approximately 800 million people playing it (1). Volleyball is a prominent collegiate sport in the United States, with about 1000 women's volleyball teams registered (2). The International Volleyball Federation (FIVB) represents well over 170 countries playing volleyball worldwide (3). The volleyball governing body in Africa is the Confédération Africaine de Volleyball (CAVB), which is based in Cairo, Egypt. The top African volleyball teams are Egypt, Tunisia, Algeria, Cameroon, and Kenya. In Kenya, volleyball is popular team sport primarily played at amateur level. The KVF league comprises a mixture of professional and amateur players.

The epidemiology of volleyball related injuries has been extensively studied among the elite and amateur players especially in the first world countries(4,5). In Kenya very little has been published regarding injuries in volleyball.

Evidentially, volleyball has much less risks for acute injuries in comparison to other closely related Olympic games like basketball, soccer, or ice hockey (6–8). Volleyball related injuries are assumed to be low because players from two teams are separated by a net, making the game largely non-contact. Volleyball is a sport that requires rapid and forceful motions of the entire body in both vertical and horizontal planes, and as a result of the immense forces at play, injuries are unavoidable (4). Interestingly, evidence from studies assessing prevalence of overuse injuries among sportspersons pitch volleyball above other team sports (9).

Epidemiological studies show variations in significant injury prevalence and rates (10–13). The risk of injury is substantially higher than during training (11,14,15). The bulk of injuries happened while athletes were in one of the front three positions during a game. A player

colliding with another player and a player colliding with the floor both accounted for 21% of game injuries (12,16).

Volleyball related time-loss injuries have a significant financial and socioeconomic impact, thus injury prevention is essential. On top of the list and accounting for roughly half of acute time-loss injuries among volleyball players is ankle sprain (6,7). However, when injuries occur then the player needs appropriate medical therapy, tailored rehabilitative program as well as well as structured return to sport strategy (17).

Globally preventative measures have been implemented by various sports authorities to reduce the incidence of injuries(2). In Kenya, there is a research gap on volleyball-related injuries, including extremely inadequate data on rates, patterns, and causes among volleyball athletes. We mostly rely on literature from developed world. This has its disadvantage because our players training level and playing conditions are different.

Based on van Mechelen Model, injuries surveillance among sports person is critical and should be assessed to determine the risks that such sport-related injuries have on the sportsperson's health status. Van Mechelen Model holds that the injuries with significant impact on player's health must be linked to their etiologies to facilitate a feasible and effective prevention strategy. (18).

There are gaps in knowledge in Kenyan research on volleyball-related injuries, including extremely inadequate data on rates, patterns, and causes among volleyball athletes.

The goal of this study is to document the prevalence, risk factors and pattern of injuries among volleyball players in Kenya during a season of the Kenya Volleyball Federation League. This research will serve as a foundation for developing injury prevention strategies and raising awareness among volleyball players.

2.0 LITERATURE REVIEW

2.1 Basics of Volleyball

Volleyball is a multiplayer sport involving two teams that are separated by a net on a volleyball court. The aim of player is to volley the ball across the net and ground it into the opponent's court as well as to defend against the same effort by the opponent. Each team is allowed a maximum of 3 touches before for returning the ball. The game begins with a serve, hit by the server over the net into the opponent's court. The game continues until the ball hits the playing court, goes out of play or a player fails to rally it properly(19).

The common play cycle is a dig, a set and a spike. As the two teams compete, points are earned or lost on basis of some rules. During the game, the players should block the opponent's spike as it passes over the net. Within each team's court, the players should have no more than three touches before passing the ball to the opponent's court. During a volleyball match, the team that wins a rally gets a point (Rally Point System). Upon winning a rally, it the team accumulates a single point and the right to serve. The team awarded a point should have the players rotate clockwise one position.

A volleyball team comprises of 6 players on either side of the court. The three front row players can jump and spike or block opponent's spike at the net. The back row players can only hit the ball over the net if they jump from behind the attack line, which demarcates the front and back part of the court(19,20).

2.1.1 Match Formats and Length of Play

Typical volleyball game has 3 main formats. 2-out-of-3 format where you need to win 2 sets. The average duration of this format is between 60 to 90 minutes. The second format is 3-out-

of-5 where you need to win 3 sets to be declared a winner. The first four sets carry 25 points each while the last set carries 15 points. To be declared a winner of a set, a team must outclass the opponent by 2 points. So a set will continue until one of the teams has a 2-point advantage. The length of play in this format can go up to 150 minutes. This is used in high level games, especially colleges and professional competition. The last and less common format is the best-of-2 (21).

2.1.2 Dimensions of Volleyball Court

For FIVB, the volleyball court is 18m long and 9m wide and is surrounded by a free zone that is 3m wide on all sides. The space 7m high from the playing surface that is directly overlying the court is called free playing space. The front row on each court ends at center line and the attack line. The standard height of net is 2.43m for men and 2.24m for women. The net is placed such that it lies vertically above the center line. Its dimension is 1m width and 9.5m--10m length and is made of 10cm square black-colored mesh. Rounded posts measuring 2.55m height are placed 0.50m-1.0m away from the side lines. The service zone is defined by a 9m wide area behind each end line and goes all the way to the end of the free zone. The front zone goes past the side lines to the end of the free zone(22).

2.1.3 Volleyball positions on the court

Position on the court is rotational. The players are required to rotate in clockwise manner when appropriate. Some of the volleyball positions on the court include setter, outside hitter, middle blocker, right-side hitter, libero and defensive specialist(20,22).



Figure 1: Volleyball roles on the court (Adapted from <https://www.volleyballanswers.com>)

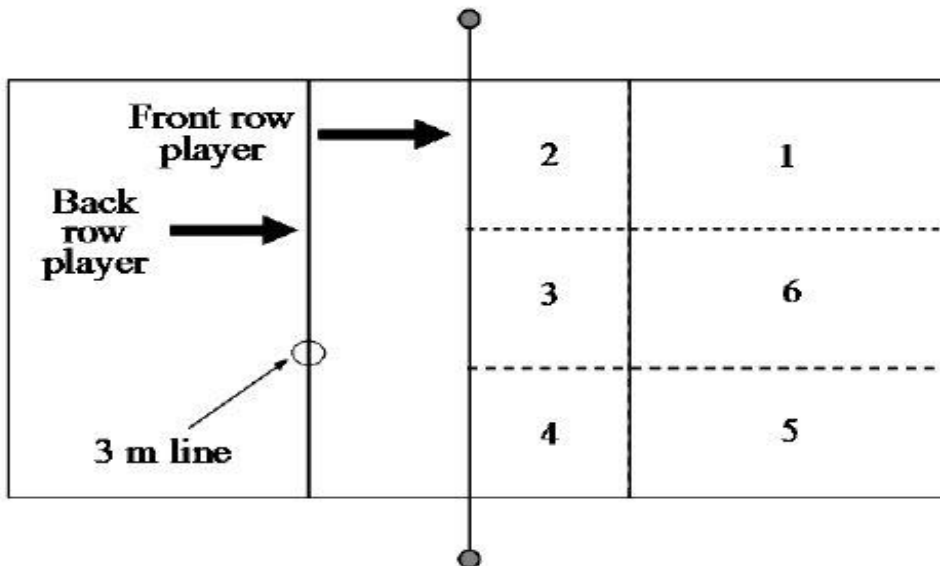


Figure 2: Volleyball positions on the court (Adapted from a study by Palao et al.)

1-Right Back, 2- Right Front, 3- Centre front, 4- Left Front 5- Left Back 6- Centre Back

2.2 Epidemiology of Volleyball Injuries

Volleyball injury rates are much less compared to those witnessed in other sports like soccer, hockey, and handball (23). According to a study conducted in Spain, the prevalence of volleyball injuries was 66.9%. A closer evaluation revealed that on average, a volleyball athlete had approximately one injury [0.94 (0.85) (range: 0-4)] (24). According to a Swedish study, on the mean injuries for a player was 0.77 (25). Volleyball injuries were estimated to be around 170,000 per year in the Netherlands (2).

In a three-year prospective study, De Loës found that volleyball was the eighth most injury-prone sport in the 14 to 20-year-old age group, with an injury rate of 3.0 per 1000 hours (26).

Schafle et al identified an overall injury frequency of 2.3 per 1000 hours during the six-day national championship of the United States Volleyball Association (27), while an incidence of 1.7 per 1000 hours has been reported in Norwegian professional volleyball players (10).

In South Africa, a study by Abdelnour et al found a prevalence rate of volleyball injuries of 88.1%. The prevalence of volleyball injuries was 45.9% amongst the female players (16).

Desalegn et al in his study reported injury incidence of 3.73 injuries per 1000 player-hours (28). Foyet et al., 2017 in a study on the prevalence of injuries and preventive measures amongst elite volleyball players in Yaounde, Cameroon reported that injury prevalence amongst male players 51.3% and female players 48.7% (13).

These rates of injuries which have been demonstrated are significantly high thus the need for continuous injury surveillance. This in turn is valuable in designing and researching the impact of injury preventative strategies.

2.3 Risk Factors for Volleyball Injuries

The etiology of volleyball injuries varies with the type of injury. The likelihood of volleyball related injuries is determined by the kind of the activity (match versus training). Sports-related injuries are caused by both internal and extrinsic factors.

2.3.1 Internal risk factors

Athlete-related internal risk factors constitute intrinsic factors, which may include but not limited to age, gender, weight, history of injuries, and individual's physique.

2.3.2 Extrinsic risk factors

On the other hand, extrinsic factors are more or less external variables such as player's exposure, both experience and environment, training conditions and technique, equipment used in the game and weather (8).

Majority of volleyball related injuries are sustained during blocking and spiking, both of which involve jumps. As a result of enormous forces involved in upright jumping coupled with other motions in volleyball, it is anticipated that injuries are bound to occur.

During match play, the risk of injury is substantially higher than during training. It's been suggested that this is due to a higher level of competition and more risks being taken during games (16,27). Injuries occurred at a rather high rate during matches, with 17.3 to 33.8 injuries per 1000 hours of play (29). The bulk of injuries happened while athletes were in one of the front three positions during a game.

The three common cause of injury include player contact (47%), surface contact (23%), and ball contact (10%) (30). In Kenya, a study on the injuries sustained during the 12th Africa volleyball club championship games held in Nairobi, majority of the injuries reported resulted from overuse (39.24%) whereas 27.69% of the injuries were from ball with contact (31). Junge et al. in a study found that a third of the injuries were due to contact(32).

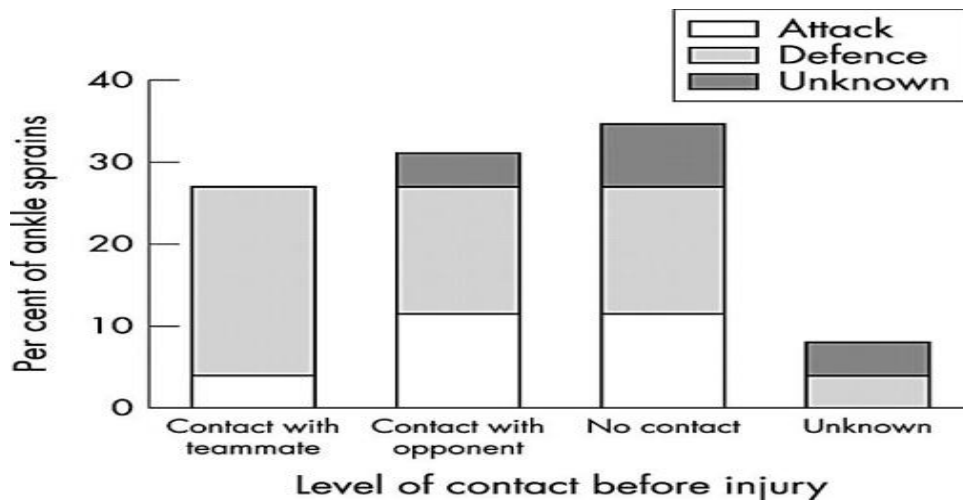


Figure 3: Ankle sprain at the net zone - contact vs. no contact (Adapted from a study by Verhagen et al.)

Most of the ankle injuries resulted from player contact, while the second most important factor for ankle injuries was non-contact trauma (6,7). Approximately 59% of ankle injuries resulted from contact (7).

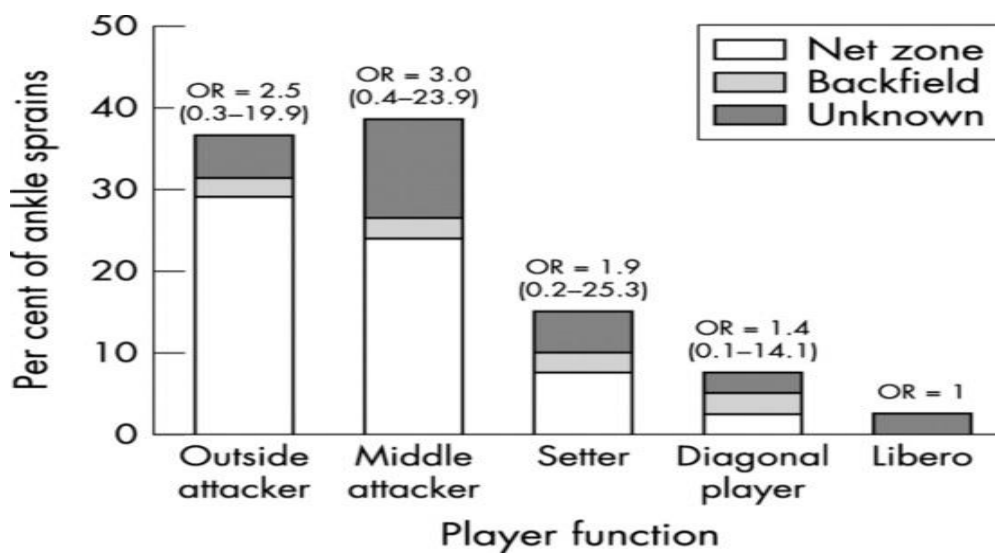


Figure 4: Ankle sprain by player role and court position (Adapted from a study by Verhagen et al., 2004)

Player role on the court influences the risk of injury. A study by Beneka Et al., 2009 found that middle hitter and outside hitters have higher injury rates (33).

Table 1: Number of injuries according to the role of the play (Beneka et al., 2009)

Position	No. of cases 226
Setter	35(15.8%)
Libero	24(10.4%)
Middle hitter	50 (22.6%)
Outside hitter	68 (31%)
Universal	44(19.9%)

The predominant injury cause for Ankle Injury (AI) has been found to be forced supination, this happens in the conflict zone just under the net when one player lands on the foot of the opponent(7). A history of ankle sprain was found to be a significant predisposing factor. The chance of repeat injury 6-12 months later was higher following initial ankle sprain(10).

Anterior knee pain was found to be a common complaint among volleyball players. Patella tendinopathy is the commonest diagnosis among athletes with anterior knee pain. Gisslen et al. reported that meniscus tears and knee sprains account for 15% of acute knee injuries (25). Engebretsen et al. found the prevalence of jumper’s knee to be 44.6% which was the highest in comparison to other sport. The study also found that the symptoms are often serious leading to long term impairment of athlete’s performance (34).

A study by de Vries et al. demonstrated that an increase in height of 5 cm, an increase of 5kg body weight, and need to jump at the workplace by a physically demanding job, were notable risk factors for jumper’s knee and patellar tendinopathy (35). Oystein et al. found that increased body weight, more weight training and better jumping performance may predispose

to patella tendinopathy (34). Patellar tendinopathy results from overuse thus more likely to occur during the match than during training (36).

Shoulder injuries is the 3rd most prevalent volleyball injury constituting 8% to 20% of all recorded volleyball injuries, but also at position two in the list of overuse injury(2).

Volleyball involves a lot of spiking and serving exposes the shoulder girdle to enormous load. As reported in a study by Kugler *et al*, longstanding overload is associated with a variety of clinical findings pointing towards shoulder overuse injury for the dominant shoulder girdles among significant proportion of elite volleyball players (37).

2.4 Pattern of Injuries Sustained in Volleyball

Despite the fact that volleyball is a relatively safe sport, players are still susceptible to an acute and overuse injuries. Such injuries may pose considerable implications (immediate and long-term) that negatively influence an individual’s or team’s performance. The ankle, knee, and shoulder were the anatomical locations with the highest injuries (7,38).

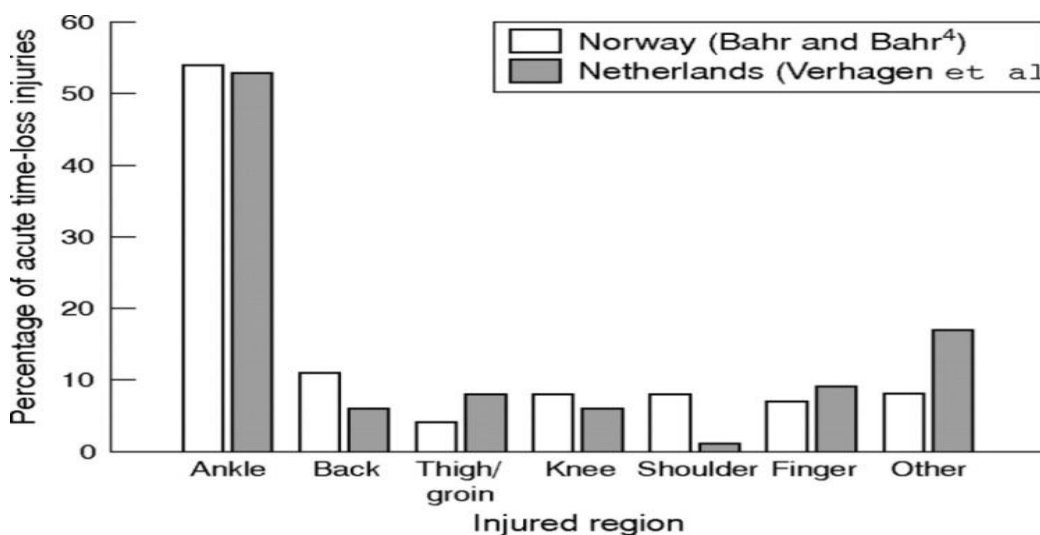


Figure 5: Pattern of injury according to anatomical location (Adapted from Bahr and Bahr with permission)

In another study, joints sprains, strains, and tendinopathies were identified to be the most prevalent and highly associated with sporting activities such as blocking and attacking(39).

The ankle was the site of the bulk of the injuries (23%), followed by the knee (18%) and the back (15%).

A slow onset was seen in 41% of the injuries(24). At the same time, a research by Reitmayer confirmed the same injury pattern. Ankle sprains were the most common injury in volleyball, accounting for 31.9 percent of all injuries. The knee was the second most affected anatomic site, accounting for 17.38% of all injuries. Finger injuries accounted for 13.44 percent of all injuries, followed by lower back injuries (12.38 percent) and shoulder injuries (12.18 percent) (40). It's tough to pinpoint the exact injury mechanisms because they usually happen swiftly and often involve multiple players.

Table 2: Summary of Volleyball Related Injuries Location

Authors	Year of Publication	Ankle	Knee	Shoulder
Bahr & Bahr	1997	54.00%	8.00%	8.00%
Agel et al.	2007	44.10%	14.10%	5.20%
Verhagen et al.	2004	41.00%	12.00%	9.00%
Augstsson et al.	2006	23.00%	18.00%	15.00%
Bahr et al.	2003	17.00%	30.00%	10.00%

Retrieved from Study by Hassan Abdelnour, November 2008

2.5 Preventive Measures

Over the years and with much importance in recent times, sports injury prevention programs have attracted significant appreciation. However, despite the diverse evidence available, it is still not clear the extent to which these prevention programs are implemented, and their

effectiveness(41). Preventative actions are justified and strongly recommended because treating these injuries takes time and effort. Furthermore, considering the high frequency of volleyball injuries and the global participation rate, prophylactic measures are necessary in volleyball. Sports injury prevention programs have received a lot of attention recently, but the extent to which they're implemented and the preventative measures that can be taken are still unknown(18).

Sports injuries can be reduced by prevention programs that include constant supervision by doctors and physiotherapists(27).

Ankle Sprains (AS) is the most prevalent type of acute injury. There are two main prophylactic programs aimed at reducing the incidence and severity of ankle sprains, which include technical training and external support. External support has been found to offer volleyball players satisfactory results when used for 6-12 months after an ankle sprain (AS) (10). Increased occurrence of new injuries necessitates a greater focus on injury prevention devices for both wounded and non-injured volleyball players, particularly for common ankle, knee, and shoulder problems. Despite the positive recorded in preventive strategies, Agel et al., posit that there should be much emphasis on preventing index AS and acute traumatic knee injury (12). Another supportive device for injury protection is the taping technique, which has become popular for protecting fingers and ankle ligament injuries. The use of non-elastic tape in conjunction with a continuous mobilization has been shown to restrict ankle dorsiflexion range of motion while leaping while having no effect on vertical jump height (42). According to Verhagen et al., effective injury prevention programs should concentrate on the ankle sprain (AS) and players with a past ankle sprain history(7).

2.5 Conceptual Framework

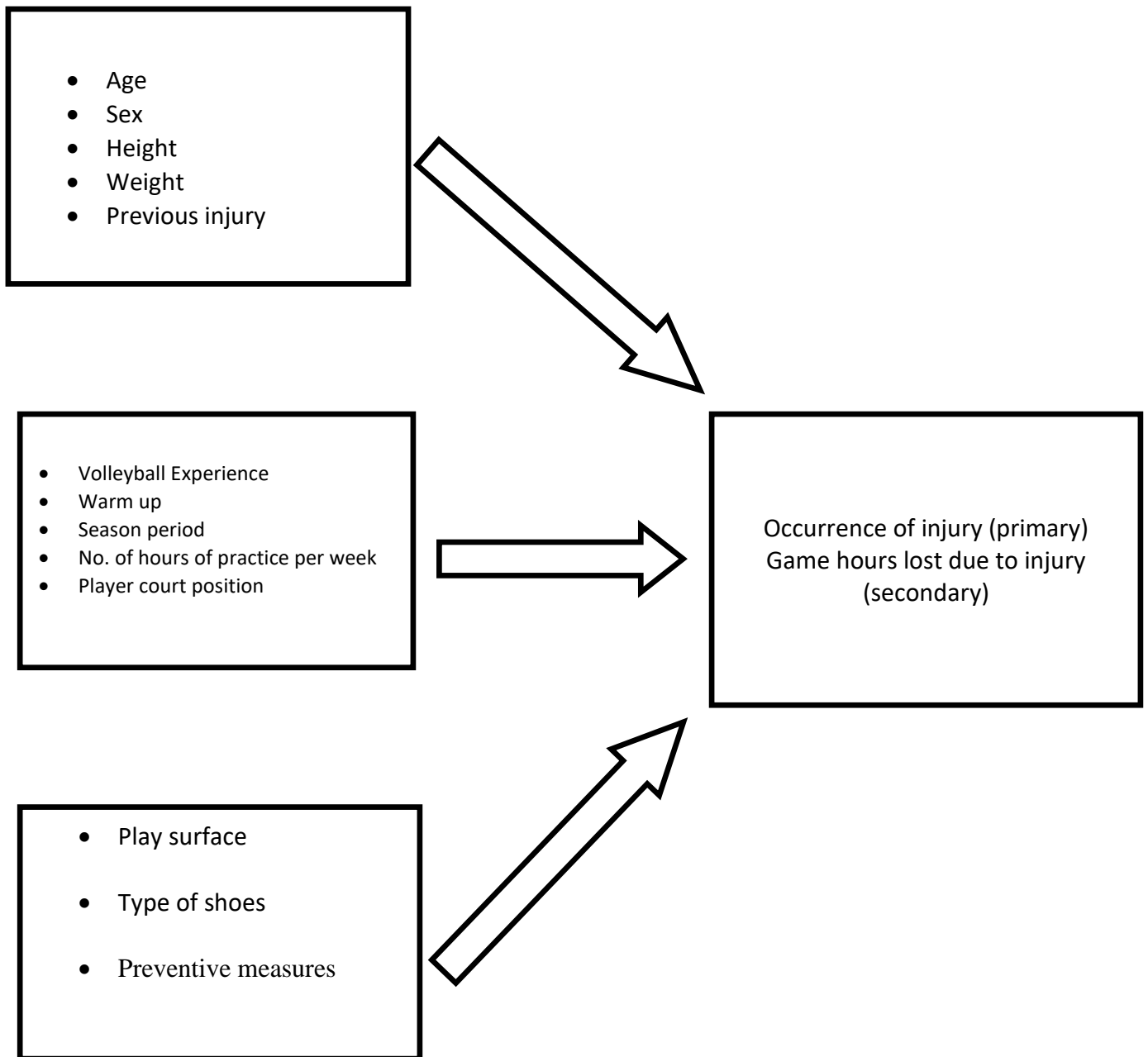


Figure 6: Conceptual Framework

2.6 Study Justification

Volleyball has grown in popularity both globally and locally. Despite the proven benefits of sporting activities there is a growing concern about sports injuries by the athletes.

Volleyball, like any other sport, has injuries that cause players to miss substantial time from their careers. Ankle injuries are linked to lost time. In 74% of the cases, injured players were able to return to training and play within two weeks after their injury. The injured players were unable to practice or play for 7-14 weeks in 10% of cases (4). Knowledge of the prevalence, risk factors, and the pattern of these injuries is required for developing prevention strategies. Most of our practice locally is based on studies in the developed countries. This poses challenges because of dissimilar playing conditions and individual athletes' characteristics. This study aims to provide insight into the prevalence, cause, and the pattern of injuries among volleyball players in the KVF league during a season, establishing a baseline for developing injury prevention strategies that are in tandem with our setting as well as raising volleyball players' awareness.

2.7 Research Question

What is the prevalence, the risk factors and the pattern of injuries among volleyball players in the KVF league during the 2021/2022 season?

2.8 Study Objectives

Broad Objective

To determine the prevalence, risk factors and pattern of injuries among volleyball players in the Kenya Volleyball Federation league during the 2021/2022 season.

Specific Objectives:

- i. To determine the prevalence of injuries among volleyball players in the Kenya Volleyball Federation league during the 2021/2022 season.
- ii. To determine the pattern of injuries among volleyball players in the Kenya Volleyball Federation league during the 2021/2022 season.
- iii. To determine the risk factors for injuries among volleyball players in the Kenya Volleyball Federation league during the 2021/2022 season.

3.0 METHODOLOGY

3.1 Study Design

This was descriptive cross-sectional study design. This approach was essential in ensuring that data was collected without manipulation of the research variables at a single point in time. The study period was done during the 2021/2022 season games scheduled from November 2021 to June 2022.

3.2 Study Setting

This study was conducted as per the Kenya Volleyball federation determined venues in Nairobi (Nyayo stadium) and Mombasa (KPA Hall) as well as the selected teams training grounds. Nyayo stadium has a capacity of 30000. It is home to several federations including Football Kenya Federation, Nyayo National Stadium is the head-quarter for Kenya Basketball Federation, Kenya Handball Federation and Kenya Volleyball Federation.

3.3 Study Population

The study population included all volleyball players involved in the Kenya Volleyball Federation league during 2021/2022 season.

3.4 Eligibility

3.4.1 Inclusion Criteria

- All volleyball players who were 18 years of age or older.
- All players who participated in more than 75% of all season's games

3.4.2 Exclusion Criteria

- Players who refused to give consent.
- New signings from outside the league

3.5 Sample Size Determination

The sample size was calculated using Fischer's formula for sample size determination (43). There was no literature available on prevalence, risk factors and pattern of injuries among volleyball players in Kenya hence 50% prevalence was used as assumption value to help arrive at the sample size representative of the cohort population. Thus, this proportion was used to calculate our sample size.

The formula is

$$n = \frac{z^2 P(1 - p)}{e^2}$$

Where

n = Sample size

Z² = Corresponding value for the confidence interval 95% (1.96)

P = Assumed prevalence of volleyball injuries is 88.1% (According the South African study by Abdelnour et al (16).

q = (1-p)

e = Margin of error 5%

Substituting the values,

$$n = (1.96^2) (0.881 \times (1 - 0.119)/0.05^2)$$

$$= 162$$

3.6 Sampling Procedure

A proportional sampling method was used to select the eligible participants. A total of 25 teams were included in the study. This comprised 19 male teams and 6 female teams. To

ensure a proportional representation of males and females in the study sample, teams formed the basis of strata.

Thus, for every team, there were $162/25 = 6.48$, approximately 7 participants were recruited. Simple random sampling of team members was used to select participants for interviewing from a specific team.

Those participants qualifying for the study were approached, informed about the study, and requested to voluntarily agree to participate. Those agreeing to participate were enrolled upon signing a consent form.

3.7 Data Collection & Variables

A structured questionnaire was used to collate data from all volleyball players involved in the Kenya Volleyball Federation league during 2021/2022 season. The questionnaire comprised of socio-demographic variables, which includes age and sex, anthropometric variable which includes height and weight. In the second part, it collected data on sports variables which include years of game experience, history of sporting (volleyball and others), season period (training vs. match), player court position, length of weekly practice in hours, shoes type, prevention approaches used, and past injuries. In the third part, the questionnaire included the injury variables. This section also comprised of when the injury happened (training or game time), the skill performed, the player's court position, and the anatomical location of the injury, with the goal of identifying the pattern and risk factors of injuries sustained, as well as the intrinsic and extrinsic factors that contributed to the injuries sustained.

3.8 Study Procedures

3.8.1 Consenting and Enrollment

All participants who are volleyball players in the KVF league were recruited. After an explanation of the study details and consenting process, they were required to sign an informed consent.

3.8.2 Quality Assurance

In an effort aimed at ascertaining the tool's reliability and validity, the tool was pretested using 10% of the sample size before actual implementation. The questionnaires used in this study were pre-tested during a training session in a pilot study to ensure that they were clear. Based on the results of the pre-test, amendments were effected to improve the tool and ensure the required data was achieved using the tool.

3.8.3 Training Procedures

Research assistants were trained for one day on how to administer the data collection tool as well as the consent.

They were also trained on how to conduct examinations to ensure that the correct data was captured.

3.9 Data Management and Analysis

All data was handled with confidentiality and the Principal Investigator stored the questionnaires in a locked cabinet and keep the key at all times. Data was also stored on a computer which was password protected. Hard-copy data collection forms will be stored in a locked safe.

The data was analyzed using SPSS version 25, and values with a p-value of less than 0.05 were considered significant. Graphs, pie charts, and tables were used to present the data. The statistical test was performed at a 95% level of significance. Frequency distribution charts and percentages were used in categorical data analysis including mean, standard deviation, ranges, medians and mode.

For hypothesis testing, Chi-square test of independence was used to assess associations between the categorical variables e.g. sex versus location of injury, or location of injury vs position on the pitch.

Student t-test was used to assess associations between continuous variables e.g. differences in means of age compared with type of injuries.

For multivariate analysis, logistic regression was used to model the strongest risk factors of volleyball injuries. The goal of the logistical regression in this study was to identify the odds and the confidence intervals. The analyzed data are presented in charts, graphs, and narratives for ease of comprehension.

3.10 Ethical Considerations

Ethical Review and approval to conduct the study were sought from KNH-UON ethical review committee, and the study was executed once approval was given.

Confidentiality of information was maintained to ensure no identifying information was collected from the players.

The study's goal was explained to the appropriate administrative organizations as well as the volleyball players. The volleyball players were assured that the study's data will be kept completely secure and anonymous. All volleyball players had the option to drop out of the study at any time.

Appropriate personal protective equipment was worn by both the research team and the players during the interview process in order to curb the spread of COVID-19 and any other infectious diseases.

3.11 Limitations

Recall bias. Players could fail to give true information regarding their participation in sport and injuries. However, collaborative data was sought from the team managers and records sought if they exist.

3.12 Study Dissemination Plan

Once data was analyzed and the manuscript developed, the results of the study shall be disseminated through seminars, surgical conferences and publication of the manuscript in a peer-reviewed journal.

4.0 RESULTS

4.1 The Demographic characteristics of the study participants

4.1.1 Age

The mean age of the players was 26.9 years with a standard deviation of 5.2, a median of 27 and with the range of 18 to 43 years (Figure 1).

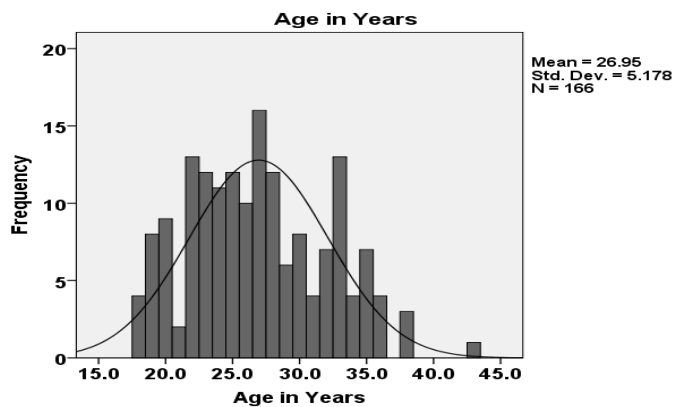


Figure 7: The figure shows the distribution of age in years

4.1.2 Sex

There were more male 104(62.7%) participants in the study than the female participants 62(37.3%) (Figure 2).

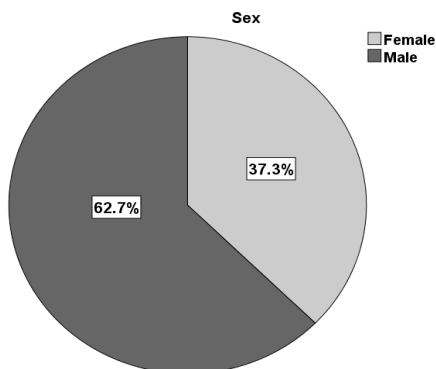


Figure 8: A pie chart representing the distribution of the sex of the study participants

4.1.3 Height

The mean height of the study participants was 178.1 cm with a standard deviation of 7.6cm and a median of 179cm with a range of 154cm to 205cm (Figure 3).

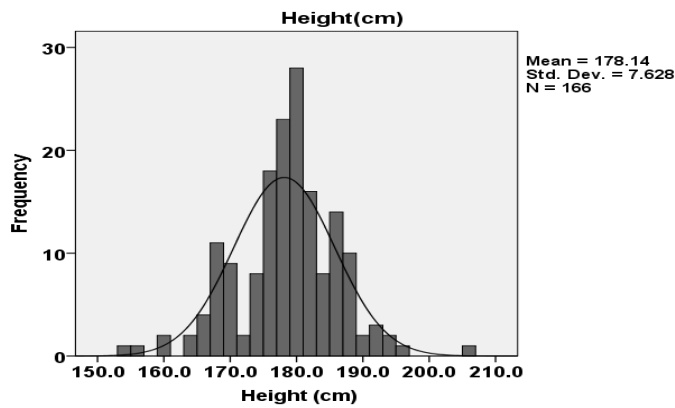


Figure 9: A histogram showing the distribution of the height of the study participants

4.1.4 Weight

The mean weight of the participants is 74.9 Kg with a standard deviation of 7.2 and a median 75 of within a range of 58 to 95(Figure 4).

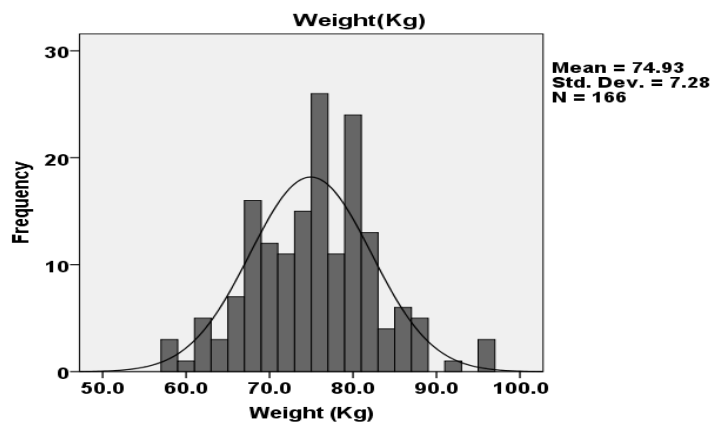


Figure 10: Distribution of the weight of the study participants

4.1.5 Duration of playing volleyball

The mean duration of playing volleyball was 7.8 years with a standard deviation of 3.9 within a range of 1 to 20 and a median of 7.9 (Figure 6).

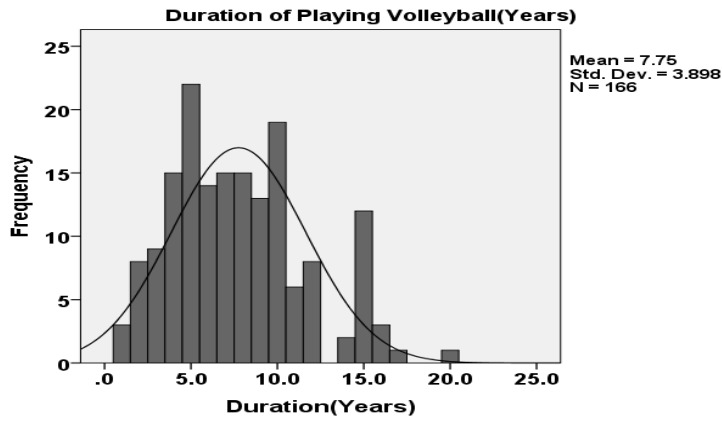


Figure 11: A histogram representing the duration of years for the players

4.1.6 Training session per week

Most of the 123 (74.5%) players attended five sessions of training per week (Figure 7).

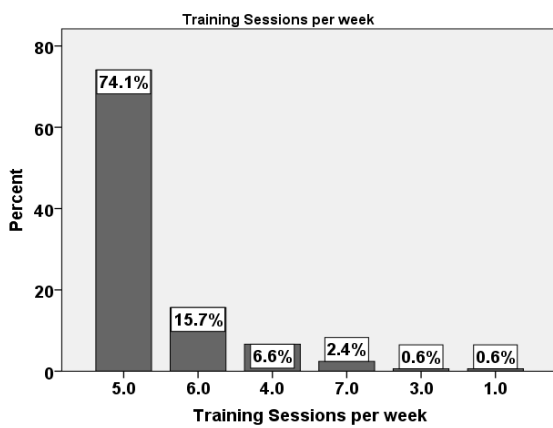


Figure 12: A bar graph of the training sessions per week

4.1.7 Hours of training per week

The players mean hours of training per week was 22.3 with a standard deviation 5.8 and median of 20 within a range of 25 to 36.

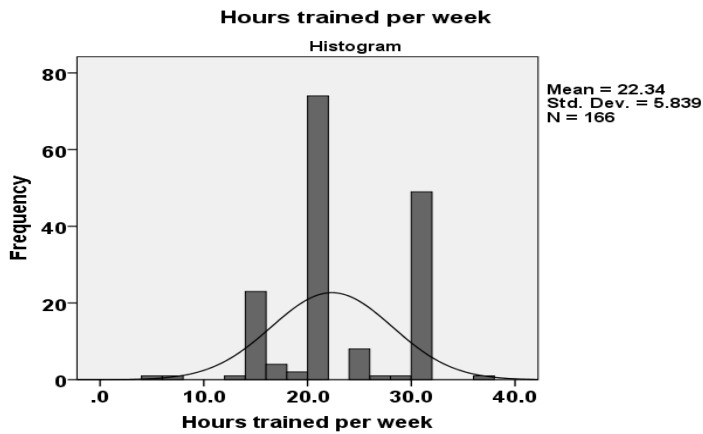


Figure 13: No. of training hours per week

4.1.8 Type of training exercise

Table 4: Table showing the types of training exercises

Exercises	Always (4)	Most of the time(3)	Sometimes(2)	Rarely(1)	Never(0)
Speed/agility	92(55.4%)	58(39.4%)	14(8.4%)	2(1.2%)	0(0%)
Endurance	83(50%)	53(31.9%)	25(15.1%)	5(3%)	0(0%)
Strength	107(64.5%)	34(20.5%)	18(10.8%)	7(4.2%)	0(0%)
Flexibility	129(77.7%)	30(18.1%)	4(2.4%)	1(0.6%)	2(1.2%)
Skill drills	147(88.6%)	15(9%)	4(2.4%)	0(0%)	0(0%)

4.1.9 Type of shoe

Table 5: The table showing the shoe types worn by the players during match and training.

Shoe type during training	Count (N=166)	Percentage (%)
Both	58	34.9
Mostly high top	25	15.1
Mostly low top	83	50

4.1.10 Type of gear

The most common protective gear worn by the participants is knee pads/brace 149(89.8%) and is followed closely by arm sleeve 97(58.4%), Finger taping 70(42.2%) and ankle brace 33(19.9%).

Table 6: The table below shows the types of protective/practice gear worn by the participants during the match/training.

Protective gear worn	Frequency	Percentage (%)
Arm Sleeve	97	58.4
Ankle Brace	33	19.9
Finger Taping	70	42.2
Knee Pads	149	89.8
Mouth Guard	1	0.7
Padded shorts	3	2
Wrist Brace	7	4.6

4.1.11 Participation in warm-up exercises before matches

166 (100%) of the participants had warm-ups before the matches

4.2.12 Injuries sustained during the previous season (2020/2021).

32(19.3%) of the study participants sustained injury during the previous season while 134(80.7%) did not sustain any injuries. Most of the participants sustained ankle injuries 14(10.5%), followed by knee injuries 10(7.5%).

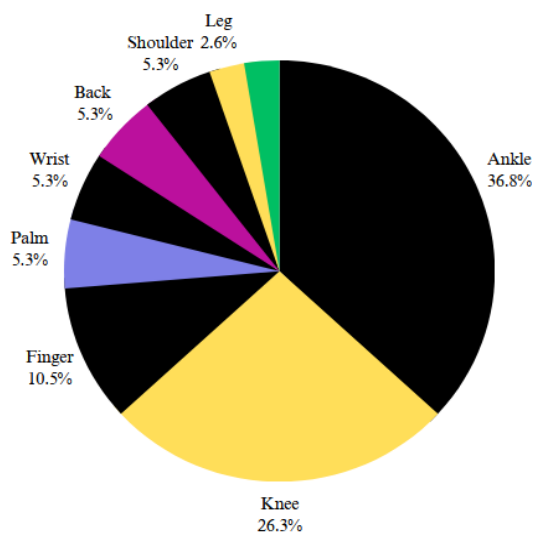


Figure 14: No. of injuries sustained during the previous season (2020/2021).

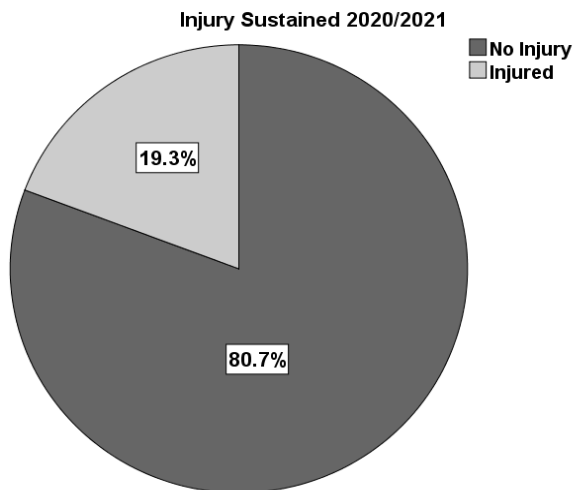


Figure 15: Pie chart illustrating prevalence of injuries sustained previous year (2020/2021)

Prevalence of injuries in the year 2020/2021 was 19.2%

$$\frac{32}{166} * 100 = 19.2\%$$

4.2 Prevalence of injuries among volleyball players in the Kenya Volleyball Federation league during the 2021/2022 season.

There were 56(33.7%) of the players who sustained injuries in the year 2021/2022 while 110(66.3%) did not sustain any injuries.

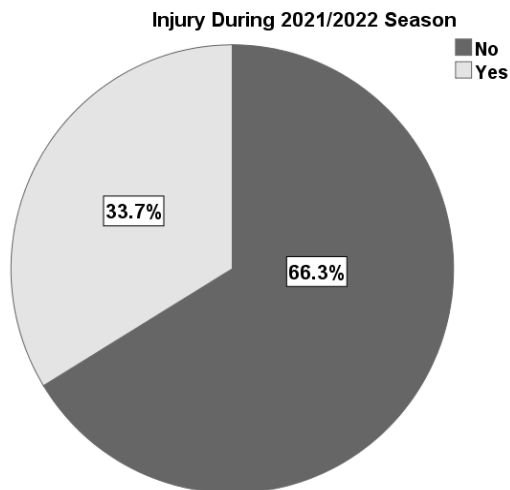


Figure 16: Prevalence of injuries during the 2021/2022 season

$$= \frac{56}{166} * 100 = 33.7\%$$

The prevalence of injuries among the volleyball players in Kenya volleyball federation league during the 2021/2022 season was **33.7%**.

4.3 The pattern of injuries among volleyball players in the Kenya Volleyball Federation league during the 2021/2022 season.

4.3.1 Anatomical pattern of injury

Most of the volleyball players sustained ankle injury 26(48.2%) followed by knee 18(32.1%) in the year 2021/2022.

Table 7: Table showing anatomical pattern of injuries sustained by players

Injury 2021/2022	Count	Percentage
Ankle	27	48.2
Foot	5	8.9
Arm	2	3.6
Finger/palm	7	12.5
Back	4	7.1
Chest/abdomen	1	1.8
Elbow	2	3.6
Groin/hip	3	5.4
Head/neck	2	3.6
Knee	18	32.1
Shoulder	13	23.2
Thigh	3	5.4
Wrist	4	7.1
Leg	2	3.6
Forearm	2	3.6

4.3.2 Type of injury sustained

Of all the injuries reported, the ligamentous sprain was the commonest (44.6%) followed by muscle injury (30.4%).

Table 8: Table illustrating the type injuries sustained.

Type	Counts	Percent
Concussion	0	0
Fracture	3	5.4
Stress fracture	0	0
Dislocation/subluxation	6	10.7
Tendon rupture	4	7.1
Ligament rupture	4	7.1
Sprain	25	44.6
Menisci/cartilage	0	0
Muscle injury	17	30.4
Skin injury	3	5.4
I don't know	10	17.9
Total	56	100

4.4 The risk factors for injuries among volleyball players in the Kenya Volleyball Federation league during the 2021/2022 season.

4.4.1 Demographic characteristics and the risk of injuries

Table 9: Table showing correlation between player demographics and injury sustained

Variable	Injury		P-Value
	Yes	No	
Age	27.6(\pm 0.8)	29.8(\pm 0.45)	0.591
Sex			
Male	36/104(34.6%)	68/104(65.35)	0.756
Female	20/62(32.2%)	42/62(67.7%)	
Height	27.9(\pm 0.4)	26.8(\pm 0.45)	0.591
Weight	73.9(\pm 0.56)	75.3(\pm 0.68)	0.415
Duration of playing volleyball	7.3(\pm 0.56)	8(\pm 0.35)	0.237
Sessions trained per week	5.1(\pm 0.07)	5.1(\pm 0.07)	0.947
Hours trained per week	22.3(\pm 0.57)	22.3(\pm 0.57)	0.995

4.4.2 Use of protective gear and the risk of injuries

Table 10: The table below represents the protective gear versus injury

Type of injury	Protective Gear worn	Injury Yes	Injury No	P-Value	Odds ratio
Ankle	Ankle brace	4/27 (14.8%)	6/29 (20.7%)	0.566	1.5 (0.3 – 8.2)
Knee	Knee brace	15/18(83.3%)	37/38 (97.4%)	0.057	7.4 (0.5 – 398)
Finger/Palm	Finger tapping	2/7 (28.6%)	20/49 (40.8%)	0.535	1.9 (0.3 – 20.1)

4.4.3 Injuries during match verses training

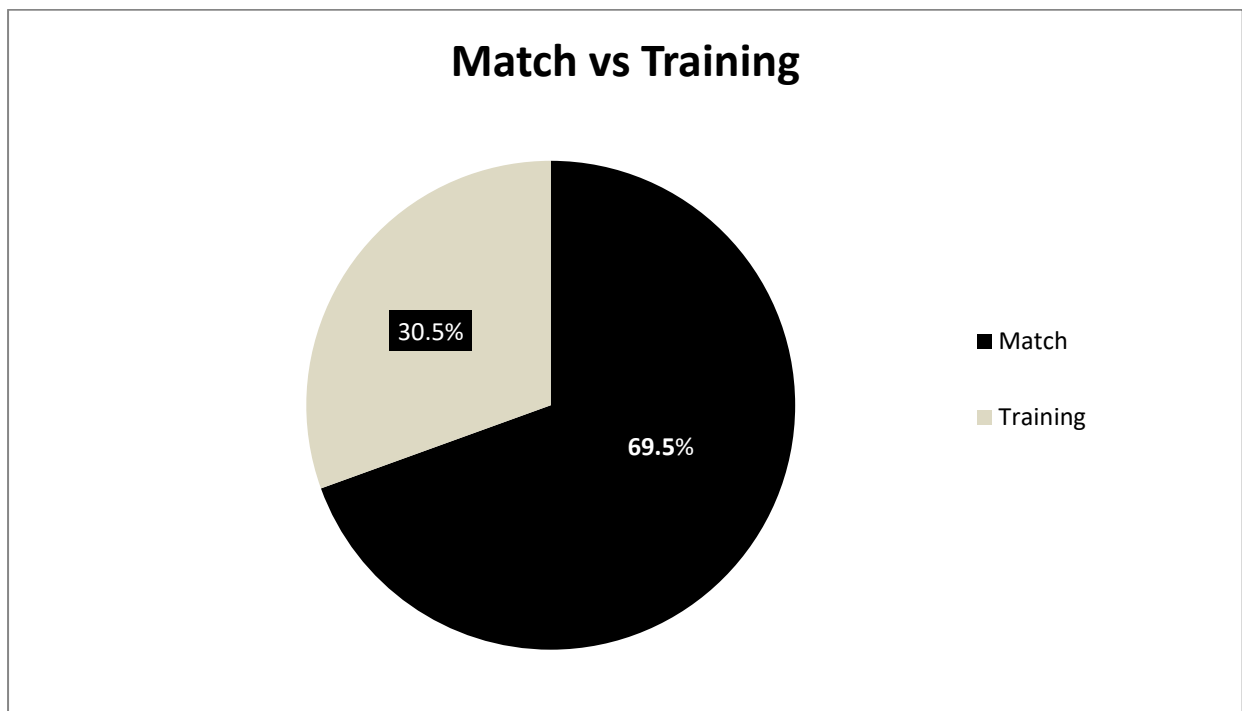


Figure 16: The injuries sustained during match versus training periods

More injuries were sustained during the match (69.5%) than during the training (30.5%) in total.

4.4.4 Types of training exercises and risk of injury

Table 11: The table below represents training exercises during training practice

	Injury Yes	Injury No	P-Value	Odds ratio
Speed/agility			0.258	Ns
1	2/2(100%)	0		
2	5/14(35.7%)	9/14(64.3%)		
3	19/58(32.8%)	39/58(67.2%)		
4	30/92(32.6%)	62/92(67.4%)		
Endurance			0.633	Ns
1	1/5(20%)	4/5(80%)		
2	11/25(44%)	14/25(56%)		
3	17/53(32.1%)	36/53(67.9%)		
4	56/166(33.7%)	56/83(67.5%)		
Strength				
Always vs sometimes/rarely	33/56(58.9%)	74/110 (67.3)	0.023	2.1 (1.0 – 4.0)
Flexibility			0.458	Na
0	1/ 2(50%)	1/2 (50%)		
1	1(100%)	0(0)		
2	2/4(50%)	2/4(50%)		
3	12/30(40%)	18/30(60%)		
4	40/129(31.1%)	89/129(68.9%)		
Skill drills			0.002	
Always/sometimes vs rarely	52/56 (92.8%)	110/110 (100)		

4.4.5 Type of shoes worn and injuries.

Table 12: Type of shoes versus shoes worn during training and matches.

	Injury Yes	Injury No	P-Value
Shoe Type			
Both	22/58(37.9%)	36/58(62.1%)	0.645
Mostly high top	7/25(28%)	18/25(72%)	
Mostly low top	27/83(32.5%)	56/83(67.5%)	

4.4.6 Situation on the court when they got the injury

Table 13: Table showing game situations within the court when injury was sustained.

	Injury Yes	Injury No	p-Value	Odds ratio
Blocking			P<0.001	192 (11.4 – 3242.3)
Yes	26/26(100%)	0		
No	30/140(21.4%)	110/140(78.6%)		
Spiking			P<0.001	90.0 (5.3 – 1535.6)
Yes	16/16(100%)	0		
No	40/150(26.7%)	110/150(73.3%)		
Defending			0.165	Na
Yes	1/1(100%)	0		
No	55/165(33.3%)	110/165(66.7%)		
Setting			P<0.001	28.4 (1.6 – 514.8)
Yes	6/6(100%)	0		
No	50/100(31.3%)	110/160(68.8%)		
Serving			0.046	10.1 (0.5 – 214.9)
Yes	2/2(100%)	0		
No	54/164(32.9%)	110/164(67.1%)		

4.4.7 Player court position and injury

Table 14: The table below shows the position the players were in when they got injury

Court position	Injury Yes	P-Value	Odds ratio (CI)
Centre Back	3/56 (5.4%)	0.07	14.5 (0.7 - 284)
Left Front	11/56 (19.6)	0.006	55.9 (3.2 - 968)
Left Back	8/56 (14.3)	0.01	41.3 (2.3 - 730)
Right Back	7/56 (12.5)	0.017	33.5 (1.9 – 597.9)
Right Front	12/56 (21.4)	<0.001	62.1 (3.6 – 1071.2)
Centre Front	20/56 (35.7)	<0.001	124.1 (7.3 - 2103)

4.4.8 Volleyball court playing surfaces

Table 15: The table below shows surface where the players got injures and injury yes/no

Surface	Injury counts N = 56
Sand	11 (19.6)
Other	6 (10.7)
Turf	2 (3.6)
Wooden	4 (7.1)
Grass	21 (37.5)
Concrete	4 (7.1)
Tarmac	14 (25)

5.0 DISCUSSION

5.1 The Demographic characteristics of the study participants

The participants in this study comprised of 104 males (62.7%) and 62 females (37.3%) totaling to 166. This was in concordance with a study by Lesman et al in which the males demonstrated higher participation rate than females. The mean age of the volleyball players was 26.9 years with a standard deviation of 5.2, a median of 27, and a range of 18 to 43 years. The mean height of the participants was 178.1 cm with a standard deviation of 7.6 cm, a median of 179 cm, and a range of 154 cm to 205 cm. Similarly, the mean weight of the participants was 74.9 Kg with a standard deviation of 7.2, a median of 75 Kg, and a range of 58 to 95 Kg. The findings on age, weight and player height were in keeping with studies from Scandinavian countries, particularly a study by de Vries et al. On average, the participants had been playing volleyball for 7.8 years with a standard deviation of 3.9, a median of 7, and a range of 1 to 20 years.

5.2 Prevalence of injuries among volleyball players in the Kenya

The prevalence of injuries among volleyball players in the Kenya Volleyball Federation league was 33.7% during the 2021/2022 season, which differs from the prevalence rate of 88.1% reported in a study conducted by Abdelnour et al. in South Africa (16). This result is comparable with study by Foyet et al. which reported prevalence of 51.3% among male and 48.7% among female players (13). However, in our current study, the prevalence of injuries during the previous season (2020/2021) among our study participants was 19.2%, indicating an increase in the prevalence of injuries.

5.3 The pattern of injuries among volleyball players in the Kenya

Although volleyball is considered a relatively safe sport, players are still at risk of sustaining injuries, which can have significant short and long-term consequences that can adversely

affect both individual and team performance. The anatomic body region most commonly affected by such injuries are the ankle, knee, and shoulder. According to the findings of this study, the majority of volleyball players experienced ankle injuries (48.2%) followed by knee injuries (32.1%), shoulder injuries (23.2%) and palm/fingers at (12.5%) during the entire season. The most commonly occurring types of injury were sprains (44.6%) and muscle injuries (30.4%). These results are consistent with previous studies, such as Reitmayer et al., which also found that ankle sprains were the most common injury in volleyball (31.9%), with the knee being the second most affected site (17.38%) (40). Similarly, Gisslen et al. reported that knee sprains and meniscus tears accounted for 15% of acute knee injuries (25). Additionally, Engebretsen et al. found that jumper's knee had the highest prevalence (44.6%) compared to other sports. A history of ankle sprain was found to be a significant predisposing factor. The chance of repeat injury 6-12 months later was higher following initial ankle sprain (10).

5.4 The risk factors for injuries among volleyball players

Our study found that demographic characteristics and the duration of playing volleyball did not have a significant association with the occurrence of injuries among the participants. History of previous ankle injury was significantly associated with repeat injuries. This finding is comparable to study by Bahr et al. (10).

The players wearing knee pads/brace were found to be 7 times less likely to sustain knee injuries, but difference was not found to be statistically significant p-value of 0.057. The use other protective gear and particularly the use of ankle braces together with shoe type didn't reduce the injuries sustained. We couldn't verify whether these gears were consistently and correctly applied which might affect the result. However, we observed that incorporating strength training and skill drills during training practice resulted in a significantly lower occurrence of injuries, as indicated by a p-value of 0.023 and 0.002 respectively.

Additionally, the players reported that they were more likely to sustain injuries during certain on-court situations such as blocking, spiking and setting, and this relationship was statistically significant with p-value of <0.001 (33). This situation happens around the highly contested net region and there is usually direct contact between the opponents (7). The players were more likely to sustain injuries during the match (69.5%) than during the training (30.5%). This can be attributed to the fact that during match the game is usually intensive and highly competitive and had higher expectations in terms of outcome as compared to the training sessions (29). The findings were concordant with study by Abdelnour et al. and Schafle et al. Certain court position, particularly the front row was significantly associated with injuries. Left Front ($p=0.006$), Right Front ($p<0.001$), Centre front ($p<0.001$). Beneka et al. found similar result in his study. There was no significant association between the play surface and injuries sustained.

STUDY LIMITATION

In addition to the previously stated findings, it is important to acknowledge the limitations of this study. One of the primary limitations was the use of a cross-sectional study design. This type of study relies on data collected at a single point in time, which can be susceptible to recall bias. In other words, participants may not accurately remember or report information about their sports participation and injury history. This study also lacks the capacity to attribute causation to factors associated with injuries. However, to mitigate this limitation, we obtained collaborative data from team managers and searched for any available records of injuries. Another limitation was the potential for selection bias. Finally, the study did not investigate the long-term effects of injuries or the effectiveness of different injury prevention strategies. Despite these limitations, the findings of this study provide valuable insights into the factors that may contribute to sports-related injuries among athletes.

6. CONCLUSION AND RECOMMENDATION

The study showed high injury prevalence. Front row court positions, situations like blocking, spiking and setting as well as match period are likely to lead to injury. Ankle is the commonest body region injured and sprain is the commonest type of injury. History of previous ankle injury was significantly associated with repeat injuries. Incorporating strength training and skill drills during training was associated with lower risk of injury.

We recommend that the players engage more in strength and skill drills, particularly the players in the front row. Additionally, there is a need for further prospective research to evaluate the effectiveness of prevention strategies. It is also essential to investigate the long-term impacts of injuries.

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8.0 APPENDICES

Appendix A: Structured Interview form

Form No. _____

VOLLEYBALL INJURY QUESTIONNAIRE

This form has 3 sections. Section I comprises of the demographic data, Section II comprises the sports characteristics and Section III comprises injury characteristics.

Please fill out all fields accurately. Thank you.

Study Title:

PREVALENCE, RISK FACTORS AND PATTERN OF INJURIES AMONG
VOLLEYBALL PLAYERS IN THE KENYA VOLLEYBALL FEDERATION LEAGUE: A
SEASON'S REVIEW

SECTION I: DEMOGRAPHICS

- Participant No -----
1. Age -----
 2. Sex Male Female
 3. Height (cm) -----
 4. Weight (Kg) -----
 5. Which team are you playing for? -----

SECTION II: SPORT CHARACTERISTICS

6. How long have you been playing volleyball (years)? -----
7. How many sessions do you train in a week? -----

8. How many hours/minutes in total do you train per week? -----hrs-----min

9. How often do you engage in the following training exercises during practice hours?

(0=never, 1=rarely, 2= sometimes, 3= most of the time, 4= always)

Tick one per row

Exercises	0	1	2	3	4
Speed/agility					
Endurance					
Strength					
Flexibility					
Skill drills					

10. What is your shoe type during the training and match? *(Mark only one)*

- Mostly high top
- Mostly low top
- Both

11. Do you use any of the following protective/practice gears during the match or training? *(Mark all that apply)*

- Finger tapping
- Mouth guard
- Arm sleeve
- Wrist brace
- Padded shorts
- Knee pads/ brace
- Ankle brace

12. Do you have warm up before the matches? (*Mark only one*)

Yes

No

13. Did you sustain any injury during the 2020/2021 season? (*Mark only one*)

Yes

No

14. What injuries did you sustain? -----

SECTION III: INJURY CHARACTERISTICS

15. Did you sustain any injury/injuries during the 2021/2022 season? (*Mark only one*)

Yes

No

16. How many injuries in total did you sustain in the whole 2021/2022 season? -----

17. Of the above injuries how many were sustained during the match? -----

18. Of the above injuries how many were sustained during the practice? -----

19. What part of your body was injured? (*Tick all that apply*)

Head and neck

Palm/fingers

Shoulder

Hip/Groin

Back

Thigh

Chest/abdomen

Knee

Arm

Leg

Forearm

Ankle

Elbow

Foot

Wrist

20. Of these injuries above which one led to missing a game /games?

- | | |
|--|---------------------------------------|
| <input type="checkbox"/> Head and neck | <input type="checkbox"/> Palm/fingers |
| <input type="checkbox"/> Shoulder | <input type="checkbox"/> Hip/Groin |
| <input type="checkbox"/> Back | <input type="checkbox"/> Thigh |
| <input type="checkbox"/> Chest/abdomen | <input type="checkbox"/> Knee |
| <input type="checkbox"/> Arm | <input type="checkbox"/> Leg |
| <input type="checkbox"/> Forearm | <input type="checkbox"/> Ankle |
| <input type="checkbox"/> Elbow | <input type="checkbox"/> Foot |
| <input type="checkbox"/> Wrist | <input type="checkbox"/> None |

21. How many days of season did you stay out due to injury in the entire season? -----

22. How many matches were you substituted due to injury in the entire season?

-----?

23. What is your court position when you got injured? (*Mark all that apply*)

- | | |
|--|---|
| <input type="checkbox"/> Right Back (Pos.1) | <input type="checkbox"/> Left Back (Pos. 4) |
| <input type="checkbox"/> Right Front (Pos. 2) | <input type="checkbox"/> Left Front (Pos. 5) |
| <input type="checkbox"/> Centre Front (Pos. 3) | <input type="checkbox"/> Centre Back (Pos. 6) |

24. In what situation did you get injured? (*Mark all that apply*)

- | | |
|-----------------------------------|---------------------------------------|
| <input type="checkbox"/> Blocking | <input type="checkbox"/> Setting |
| <input type="checkbox"/> Spiking | <input type="checkbox"/> Defending |
| <input type="checkbox"/> Serving | <input type="checkbox"/> I don't know |

25. On what play surface were you when you got the injury? (*Tick all that apply*)

- Concrete
- Grass
- Turf e.g. astro
- Wooden
- Asphalt/tarmac
- Sand

26. What was the probable cause of the injury? (*Tick all that apply*)

- Collision with a player from my team
- Collision with opponent player
- Collision with stagnant object(net or poles)
- Hit by moving ball
- Violation of rules/ foul
- Other
- I don't know

27. According to your care giver what type of injury did you sustain? (*Tick all that apply*)

- Concussion (regardless of loss of consciousness)
- Fracture (traumatic)
- Stress fracture (overuse)
- Dislocation, subluxation
- Tendon rupture
- Ligamentous rupture
- Sprain (injury of joint and/or ligaments)
- Lesion of meniscus or cartilage
- Muscle injury
- Skin injury

Appendix B: Informed consent English version

Participant information and consent form for enrollment in the study

This consent form will be administered to all eligible persons. We are requesting you to take part in this research whose title is:

PREVALENCE, RISK FACTORS AND PATTERN OF INJURIES AMONG VOLLEYBALL PLAYERS IN THE KENYA VOLLEYBALL FEDERATION LEAGUE: A SEASON'S REVIEW

Principal Investigator:

Dr. Hussein Ibrahim Hussein

Registrar at the Orthopaedic Surgery Unit,

Department of Surgery, School of Medicine,

University of Nairobi.

This Informed Consent Form has three parts:

1. Information Sheet (informs you in a brief overview about the research with you).
2. Certificate of Consent (for you to sign if you agree to take part).
3. Statement by the researcher/person taking consent.

PART I: Information Sheet

Introduction

This study is titled: **PREVALENCE, RISK FACTORS AND PATTERN OF INJURIES AMONG VOLLEYBALL PLAYERS IN THE KENYA VOLLEYBALL FEDERATION LEAGUE: A SEASON'S REVIEW.**

The study involves data collection from eligible participants. We seek to find out frequency of injury among volleyball players, the commonest part of the body that gets injured as well as the causes of these injuries.

The information obtained from this study helps to broaden our understanding of these injuries. This in turn becomes basis for instituting correct preventive measure among athletes during match as well as training. Additionally, the study helps governing authority to make policies that help grow volleyball as a sport.

Voluntary participation/right to refuse or withdraw

It is your decision to participate or not. Whether you choose to participate or not does not in any way affect you. You shall not be victimized or denied any services whatsoever.

Confidentiality

The information obtained in this study will be treated with confidentiality and only be available to the principal investigator and the study team. Your name will not be used. Any personal information will have a number on it instead of your name. We will not be sharing the identity of those participating in this research.

Study procedure

After agreeing and consenting to participate in the study, various measurements shall be taken from you including your weight and height.

Sharing the results

The knowledge obtained from this study will be shared with the policymakers in KVF and doctors through publications and conferences. Confidential information will not be shared.

Benefits

The benefits of joining the study include:

- I. Contribution to the advancement of sports medicine.
- II. The information may be used to guide policymaking in matters pertaining to volleyball as a sport.
- III. There will be no risk involved by enlisting for this study.

Cost and compensation

There will be no extra cost incurred for participating in this study nor is there compensation offered.

Ethical Consideration

This research proposal has been reviewed and approved by the UoN/KNH Ethics and Research Committee, which is a committee whose task is to make sure that research participants are protected from harm.

Who to contact

If you wish to ask any questions later, you may contact:

Principal Researcher:

DR. HUSSEIN IBRAHIM HUSSEIN

Phone: 0723088695

Email: hussein28652009@gmail.com /hussein11349@students.uonbi.ac.ke

Department of Surgery, School of Medicine, University of Nairobi

University of Nairobi /Kenyatta National Hospital Supervisors:**DR. VINCENT MUOKI MUTISO**

Senior Lecturer, Consultant Orthopaedic, Trauma Surgeon and Sports Medicine

Chairman Orthopaedic Surgery Thematic Unit, Department of Surgery

University of Nairobi

P.O. Box 19681-00202 Nairobi, Kenya.

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DR. FRED CHUMA SITATI

MBChB, MMed (Ortho), FCS (ECSA), Dip SICOT, PhD (Ortho, UoN)

Consultant Orthopaedic Surgeon (Arthroplasty, Arthroscopy and Trauma)

Senior Lecturer Orthopaedic Surgery Unit, Department of Surgery

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DR. VICTOR BARGORIA

Consultant Orthopaedic Surgeon and Trauma Surgeon

Sports Medicine (Team Physician, Athletics Kenya)

Division of Orthopaedics, Kenyatta National Hospital

Email: bargoriavictor@gmail.com

PART II: Certificate of Consent

I have read and understood the above information/the above information has been read out to me. I have had the opportunity to ask questions and the questions that I have asked have been answered satisfactorily. I voluntarily agree and consent to participate in this research.

Print Name of Participant _____

Signature of Participant _____

Date

If Non -literate:

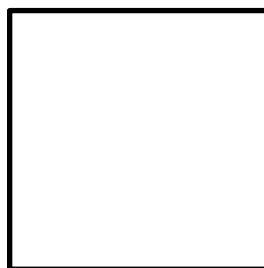
I have witnessed the reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I can confirm that the individual has given consent voluntarily.

Print Name of witness _____

Thumb print of participant

Signature of witness _____

Date _____



PART III: Statement by the researcher

I have read out the information sheet to the participant, and made sure that the participant understands the whole information on the consent form.

A decision to refuse to participate or withdrawal from the study will not in any way affect the subjects.

All information given will be handled with confidentiality.

The results of this study might be published to facilitate research and improved clinical guidelines. I can confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the approval has been given voluntarily.

Name of researcher/person taking consent _____

Signature of researcher/person taking consent _____

Date _____

Appendix C: Informed consent - Swahili version

Fomu Ya Makubaliano Ya Kujiunga Na Utafiti

Fomu ya makubaliano

Nimeelezwa utafiti huu kwa kina. Nakubali kushiriki utafiti huu kwa hiari yangu. Nimepata wakati wa kuuliza maswali na nimeelewa kuwa iwapo nina maswali zaidi, ninaweza kumwuliza mtafiti mkuu au watafiti waliotajwa hapa juu.

Jina la Mshiriki _____

Sahihi ya mshiriki _____

Tarehe _____

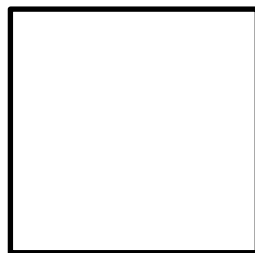
Kwa wasioweza kusoma na kuandika:

Nimeshuhudia usomaji na maelezo ya utafiti huu kwa mshiriki. Mshiriki amepewa nafasi ya kuuliza maswali. Nathibitisha kuwa mshiriki alipeana ruhusa ya kushiriki bila ya kulazimishwa.

Jina la shahidi _____ Alama ya kidole cha mshiriki

Sahihi la shahidi _____

Tarehe _____



Ujumbe kutoka kwa mtafiti

Nimemsomea mshiriki ujumbe kiwango ninavyoweza na kuhakikisha kuwa mshiriki amefahamu yaliyomo katika fomu hii.

Kutoshiriki au kujitoa kwenye utafiti huu hautamdhuru mhusika kwan amna yoyote ile. Ujumbe kuhusu majibu yake yatahifadhiwa kwa siri.

Matokeo ya utafiti huu yanaweza chapishwa ili kuboresha hali ya mchezo huu wa voliboli.

Ninathibitisha kuwa mshiriki alipewa nafasi ya kuuliza maswali na yote yakajibiwa vilivyo.

Nina hakikisha kuwa mshiriki alitoa ruhusa bila ya kulazimishwa.

Jina la mtafiti _____

Sahihi ya Mtafiti _____

Tarehe _____

Appendix D: Letter to KVF

Received and study approved.
Kenya Volleyball Federation will accord Dr Hussein
Ibrahim all the support
Charles B.D. Nyabeni
Deputy President
KVF

DR HUSSEIN IBRAHIM
P.O BOX 5-30300
KAPSABET

THE VICE PRESIDENT
KENYA VOLLEYBALL FEDERATION
P.O. BOX 61106 - 00200
NAIROBI

KENYA VOLLEYBALL FEDERATION
P. O. Box 61106 - 00200
NAIROBI - KENYA
Date: 20/06/2022

Dear Sir/Madam,

**RE: PERMISSION TO CONDUCT A STUDY AMONG THE VOLLEYBALL PLAYERS
IN THE KVF LEAGUE**

I am a post graduate student at the University of Nairobi. I am currently in 4th year of my Masters in Orthopedic Surgery program.

I plan to conduct study among volleyball players to determine the occurrence, causation, and pattern of injuries incurred by players over the course of a season. This research project will be submitted as part of the course's requirements for graduation.

After the research has been approved by the ethics and research council at Kenyatta National Hospital, where I am currently based, only participants who consent will be sampled. Those who refuse to participate will not be threatened or forced to do so in any way. All of the information gathered will be kept in strict confidence. The outcomes of the study will be disseminated to the federation.

The findings of this study contribute to a better understanding of these injuries. This, in turn, serves as the foundation for implementing proper preventive measures among athletes during both competition and training. Furthermore, the research aids governing bodies in developing policies that promote volleyball as a sport.

For more information, I've attached a copy of my proposal.

I respectfully ask permission to continue my research project.

Thank you.

Sincerely,

Dr Hussein Ibrahim

Resident, Orthopedic Surgery.

Appendix E: Ethical Approval letter



UNIVERSITY OF NAIROBI
FACULTY OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
Tel: (254-020) 2726300 Ext 44355



KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

KNH-UON ERC

Email: uonknh_erc@uonbi.ac.ke
Website: <http://www.erc.uonbi.ac.ke>
Facebook: <https://www.facebook.com/uonknh.erc>
Twitter: [@UONKNH_ERC](https://twitter.com/UONKNH_ERC) https://twitter.com/UONKNH_ERC

Ref: KNH-ERC/A/522

Dr. Hussein Ibrahim Hussein
Reg. No H58/11349/2018
Dept. of Orthopaedic Surgery
Faculty of Health Sciences
University of Nairobi

19th December, 2022



Dear Dr. Hussein,

RESEARCH PROPOSAL: PREVALENCE, RISK FACTORS AND PATTERN OF INJURIES AMONG THE VOLLEYBALL PLAYERS IN THE KENYA VOLLEYBALL FEDERATION LEAGUE: A SEASONS' REVIEW (P739/09/2022)

This is to inform you that KNH-UoN ERC has reviewed and approved your above research proposal. Your application approval number is **P739/09/2022**. The approval period is 19th December 2022 – 18th December 2023.

This approval is subject to compliance with the following requirements;

- i. Only approved documents including (informed consents, study instruments, MTA) will be used.
- ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by KNH-UoN ERC.
- iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to KNH-UoN ERC 72 hours of notification.
- iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH-UoN ERC within 72 hours.
- v. Clearance for export of biological specimens must be obtained from relevant institutions.
- vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
- vii. Submission of an executive summary report within 90 days upon completion of the study to KNH-UoN ERC.

Appendix F: NACOSTI Research License



NATIONAL COMMISSION FOR
SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 262689

Date of Issue: 14/February/2023

RESEARCH LICENSE



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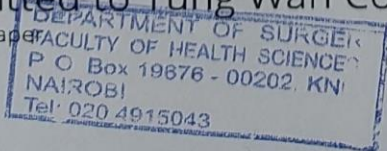
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