Adaptive Sports

Sports injuries in sitting volleyball athletes: a systematic review

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Abstract - After becoming a paralympic sport, sitting volleyball experienced solid development, a fact that required a greater increase in intensity and frequency in training and competitions, contributing to increased competitiveness and the appearance of injuries.

Objective: Identify the epidemiological aspects of sports injuries in sitting volleyball athletes. **Methods:** This systematic review followed the declaration of preferred reporting items for systematic reviews and meta-analyses (PRISMA) and was registered in the International Prospective Register of systematic reviews (PROSPERO). The search was carried out in the bases: PubMed, BVS, SciELO, and Medline. We included studies on sports injuries in sitting volleyball, with a sample composed of competitive athletes at least 1 year old and over 18 years old, published between 1981 and 2022, in English, Spanish or Portuguese. **Results:** This review showed a clinical incidence of 0.57 and a prevalence of 54.1% of injuries. Injuries occurred mainly in the upper limbs, specifically in the shoulder, by overload mechanism, during training, resulting in time loss, which were severe and nonrecurring. **Conclusion:** Therefore, we found a high occurrence of injuries in the sport and showed characteristics of the injury profile, essential information for directing preventive conduct, planning, and protection of the athlete's health.

Keywords: epidemiology, athletic injury, para-athlete, volleyball.

1. Introduction

The first record of adapted sports dates from 1871, when the School of Deaf, in Ohio (United States), offered sports for deaf students. Later, in 1924, the first international competition for people with disabilities appeared, known as the "Games of Silence", with 145 participants from 9 nationalities, held in Paris (France)[1]. However, the rise of sport for people with disabilities took place after the Second World War, in 1944, in order to promote rehabilitation and social inclusion for maimed combatants[2]. In this scenario, the German physician Ludwig Guttmann received an invitation from the British government to develop a spinal cord trauma center at Stoke Mandeville Hospital[2]. After four years, the neurosurgeon introduced archery and basketball wheelchair competitions, among ex-soldiers with spinal cord injuries, an event known as the Mandeville Stoke Games[3].

In 1960, the competition was renamed the Olympics for the Disabled (currently the Paralympic Games), being held in Rome (Italy), after the 17th edition of the Olympic Games[3]. Subsequently, the Paralympic Games began to be held every four years in line with the Olympic event, at the same headquarters, using the same facilities, a fact that boosted the strengthening of parasports as a performance sport[1,3]. Since then, 16 editions of Paralympic Games have been held, with a significant increase in the participation of athletes, greater competitiveness, and visibility. While the first edition had 400 athletes, the last event held (Tokyo 2020) registered 4000 athletes from 163 countries, competing in 23 modalities[4].

Among the summer modalities, there is Sitting Volleyball, which emerged in Netherlands in 1956, after adaptation and combination between Sitzball and conventional volleyball, becoming a more attractive and dynamic modality[5]. The sport was officially introduced to the Paralympic Games in 1980, in Arnhem (Netherlands)[5,6]. Currently, sitting volleyball is one of the main paralympic sports, involving 75 countries and more than 10.000 athletes[7]. Athletes with low spinal cord injuries, cerebral palsy, amputations, decreased muscle strength, restricted joint movement, and joint instability play the sport. Its practitioners have locomotor impairment as a factor that directly interferes with the decrease in balance, proprioception, coordination, and strength asymmetry, in addition to experiencing biomechanical adaptations or substitutions, factors that are associated with the onset of sports injuries[7,8].

With regard to sports injuries, recently, for the development of the IOC consensus statement on methods for recording epidemiological studies in sports injury and disease, Bahr et al. (2020) use an inclusive definition, considering injury as tissue damage or disturbance of normal physical function as a result of sports practice, resulting from the rapid or repetitive transfer of kinetic energy.

In sitting volleyball, the diagnosis of muscle injuries, dislocations, tendon rupture, and impingement syndrome stands out, with the occurrence of injuries located mainly in the shoulders, fingers, and lumbar region. Most injuries in the modality would be related to the overload mechanism, due to the characteristics of the sport associated with the specificities of the pre-existing locomotor impairment resulting from the disability[9,10]. One of the main points to be discussed in the modality is the overload on the upper limbs, the main responsibility for the fundamentals of the game and displacement on the court. Furthermore, this dual function is also associated with daily movements of wheelchair- athletes or those who use crutches. Thus, the similarity of frequently repeated movements during the practice of the modality and daily actions, direct impact with the ground, increase in muscle function, lack of body stability associated with a decrease in strength, or bilateral asymmetries are related to a higher prevalence of injuries due to overload on upper limbs and trunk[11].

Studies on sports injuries in Paralympic sports have been published reporting the main injuries[12,13] and the role of the physical therapists in Paralympic sports[14]. Among injuries, overload injuries occur frequently, with two main causes: the first is related to the training load and the second is associated with athletes without adequate physical conditioning, causing stress and overload in several osteomioarticular structures consequently interfere with sports performance[15]. The constant development of the modality and the increase in visibility stimulated a greater introduction of athletes demanding an increase in the intensity and frequency of training and competitions, contributing to the occurrence of sports injuries. The risk of injury is a harmful reality for the athlete, as its occurrence can result in removal or decreased performance[8].

On this occasion, the search for causality, risk factors, and obtaining an accurate diagnosis is important for the implementation of adequate treatment, preventive planning, and production of protective equipment[16]. Such importance is highlighted in a recent systematic review investigating injuries in wheelchair basketball players indicating that injury prevention should focus the structure of training and organization of medical teams in competitions[13] .

Given this scenario, we chose to conduct a systematic review with the following main objective: a) Identify the epidemiological aspects of sports injuries in sitting volleyball athletes, with the specific objectives; b) Find the prevalence and incidence of injuries in sitting volleyball; c) Check the frequency/distribution of injuries by anatomical regions; d) investigate the diagnoses of the injuries; e) analyze values related to injury classifications in terms of mechanism, time, moment, severity and recurrence.

2. Materials and methods

2.1. Study definition

This review followed the declaration of Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA)[17] and was registered on the International Prospective Register of Systematic Reviews (PROSPERO) platform with the following identification: CRD42021243996.

Keywords defined for the study were selected through Health Sciences Descriptors (DeCS) and Medical Subject Headings (MESH) consisting of: “Prevalence”, “Incidence”, “Epidemiology”, “Injury”, “Para-athlete”, and “Sitting volleyball”. The strategies used for the search were (prevalence OR incidence OR epidemiology OR injury) AND (para athlete OR for athlete OR for athletes OR paralympians OR paralympic athletes OR athlete, paralympic OR paralympic athlete OR paralympian OR sitting volleyball). This strategy aimed to identify the epidemiological aspects of sports injuries in sitting volleyball athletes.

The search platforms selected for the research were PubMed, Biblioteca Virtual em Saúde (BVS), SciELO, and the Medical Literature Analysis and Retrieval System Online (MEDLINE). The search was carried out in January 2023. Regarding the criteria, this research included descriptive and analytical studies, which present data on the profile of sports injuries in sitting volleyball athletes with a sample composed of athletes over 18 years old, competitive for at least one year, published between 1981 and 2023, in English, Portuguese, or Spanish. On the other hand, review articles that consider injuries not related to the sport and not diagnosed by health professionals were excluded from the research. EndNote software was used to remove duplicates.

To assess the methodological quality and risk of bias, the Statement Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) and its extension, the Statement STROBE Sports Injury and Illness Surveillance (STROBE-SIIS), were used. The article could score up to 22 and 23 points, respectively. For these instruments, the higher the score, the better the methodological quality[18].

2.2. Selection and data extraction

Two reviewers independently examined the articles and extracted descriptive data; in case of disagreement, a

third reviewer was consulted. The qualitative and quantitative information extracted were: author(s), year, sample, sex, country of publication, dimension, statistics, number of injuries, injury definition, epidemiological measures, injury mechanism, type of port activity, injury location, injury diagnosis, injury severity, and injury recurrence. To analyze the observed results, using comparable assessment methods, the information was organized into four tables.

2.3. Study flow

The search strategy used allowed us to identify 1853 records. Subsequently, 1072 duplicates were excluded, leaving 786 records for analysis. Then, there was a screening of titles and abstracts, in which 768 abstracts were excluded, leaving only 18 selectable. At that time, 18 texts of available full articles were evaluated, of which 8 articles did not meet the selection criteria. Finally, ten articles were chosen for inclusion in this systematic review. This flow of studies can be seen in Figure 1.

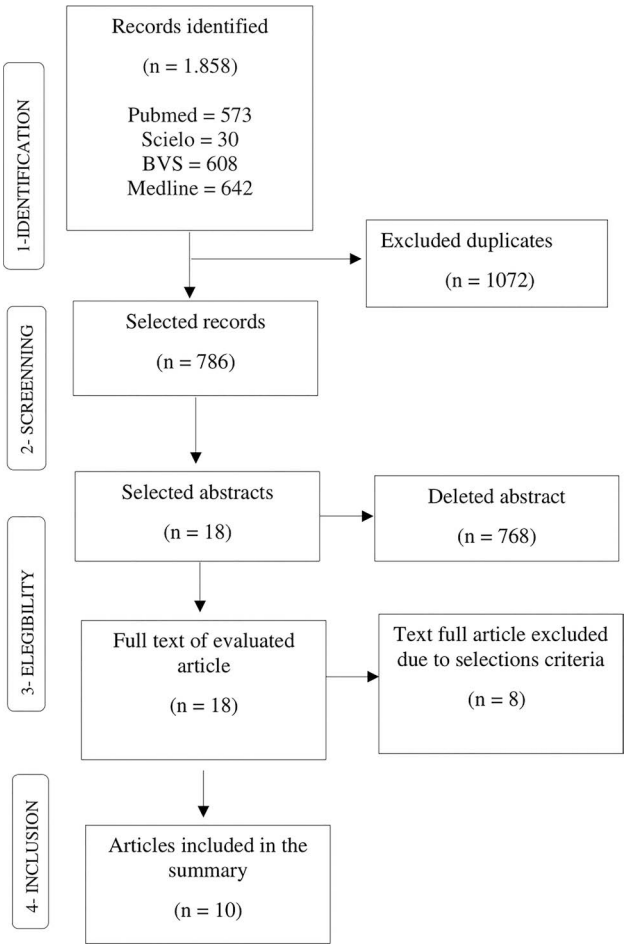

Figure 1 - Flowchart of preferred report items for systematic review and meta-analysis representing the process of searching for epidemiological articles.

3. Results

The articles included in this review were published between 2000 and 2019, being produced in six different countries: Brazil[10,19,20], United States[21,22], Poland[23,24], South Africa[25], Rwanda[26], and Iraq[27] (Table 1).

Also, five of the articles have a multi-sport dimension[20,21,22,24,25] while the others address a single modality[10,19,23,27]. Regarding the methodology, six studies consisted of cross-sectionals descriptive studies[10,19,21,23,24,27], three in prospective cohort[22,25,26], and just one in retrospective cohort[20].

An essential piece of information in epidemiological studies on sports injuries is the presence of the definition of injury. In the articles in this review 70% (7) presented the definition of what would be considered injury[9,10,20,22,24,25,26] with variations between them. A total of 869 athletes were involved; 367 were injured athletes and 413 reported injuries (Table 1). Six studies were conducted with athletes of both sexes[10,20,21,22,25,26], three with males only[23,24,27] and one with female athletes[9].

After the analysis, the median quality of the selected studies was determined. The studies averaged 13.4 and 15.2 points according to the STROBE and STROBE-SIIS statement, respectively, and none of the studies achieved the maximum score. All studies reported details about the theoretical framework, reasons for carrying out the research, description of objectives, preexisting hypotheses, eligibility criteria, sources and methods for participants recruitment, and the external validity of their results. On the other hand, only three studies[10,21,25] mentioned methods to control confounding and loss or sensitivity. Furthermore, a single article[20] reported estimates adjusted for confounding variables and confidence intervals. Finally, none of the studies described methods to assess the risk of bias or presented results of bias assessment risk.

However, studies show selection bias[10,23], memory bias[9,10,23,24,27], and measurement bias by inadequate instruments[10,19,23,24,26].

Injury reporting was diverse in all studies. The average prevalence estimate was 54.1%, while the clinical incidence was 0.57. Regarding the mechanism, 42% of the injuries were traumatic and 58% were due to overload (Table 2).

Acute and chronic injuries represented an average of 66% and 16%, respectively, while 18% of injuries could not be defined. In turn, the data referring to the type of port activity present an average value of 48% for those occurring during training, 47% in periods of games/competition, and 5% in others. Concerning time loss, 52% of the athletes needed to take time away from sports practice temporarily. Of these, 20% had minimal severity, 12% mild, 20% moderate, 38% severe, and 10% others. Regarding recurrent injuries, on average, 43% of players reported having had a second injury after treating the

Table 1 - Characteristics of the studies.

Studies	Sample	Sex	Country	Dimension	Study design	Injured	Injuries	Injury definition
Nyland et al. (2000)	96*	Both	USA	Multisport	Descriptive Transverse*	66	66	Not
Wieczorek et al. (2007)	48	Male	Poland	Single modality	Descriptive Transverse*	48	50	Not
Assumpção et al. (2007)	12	Feminine	Brazil	Single modality	Descriptive Transverse*	12	12	Yes
Molik et al. (2011)	34	Male	Poland	Multisport	Descriptive Transverse*	17	17	Yes
Willick et al. (2013)	154	Both	USA	Multisport	Cohort Prospective	23	23	Yes
Souza et al. (2015)	20	Both	Brazil	Single modality	Descriptive Transverse	10	10	Yes
Derman et al. (2017)	127	Both	South Africa	Multisport	Cohort prospective	17	21	Yes
Macedo et al. (2019)	127*	Both	Brazil	Multisport	Cohort Retrospective	73	74	Yes
Assuman et al. (2019)	158	Both	Rwanda	Single modality	Cohort Prospective	58	89	Yes
Ghafour (2019)	93	Male	Iraq	Single modality	Descriptive Transversal*	43	51	Not
Total	869	-	-	-	367	413	-	

*Number of participating volleyball athletes during the Paralympic Games edition (IPC, 2020).

initial injury, while 57% indicated that there was no recurrent injury. Regarding the location of the injuries, in which ten anatomical sites were mentioned; this was the most reported variable, present in 90% of the studies (Figure 2).

Considering general values, 28.9% of the injuries were located in the shoulder, demonstrating that it is the most affected region among the studies included in this review. The spine region stands out with 16.1%, hands/fingers 18.0%, pelvis/hips 12.6%, and wrist with 12.2% of injuries. On the other hand, the regions least affected by injuries consist of the thigh/leg with 4.5% and the arm/forearm with 6.0% of injuries.

In addition to presenting the percentage by specific location, it was also possible to group data and present the results for upper limbs (MMSS), lower limbs (LL), spine, and head/neck, expressed in Table 3. The upper limbs concentrated 53.8% of the lesions, while 13.2% were located in the lower limbs, 17.8% in the trunk, 5.0% in the head/neck, and 9.6% in others (without specification).

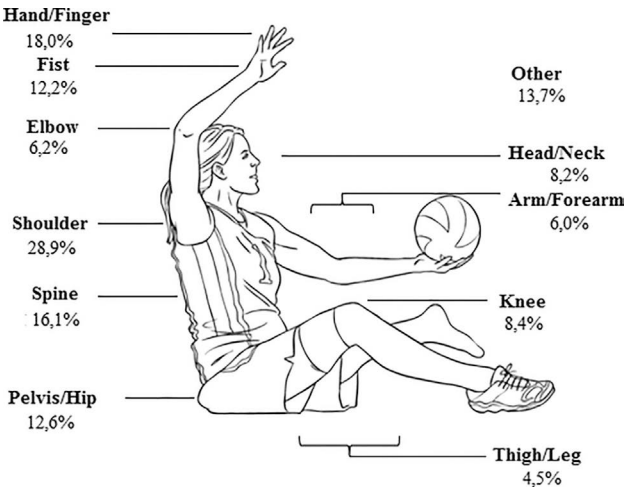

Figure 2 - Anatomical sites affected by lesions reported as percentages.

Finally, relating diagnosis and tissue, 41.8% of the sample developed muscle/tendon injuries, 26.2% joint injuries, 11% bone injuries, 15.2% skin injuries, while 21.9% had complaints of pain and other types of injury (Table 4).

4. Discussion

The main objective of this study was to identify the epidemiological aspects of sports injuries in sitting volleyball athletes. For this, we use it as a basis for defining sports lesions the consensus of IOC of Bahr et al. (2020), which uses an inclusive definition, considering damage to tissue or disorder of normal physical function due to sports, resulting from the rapid or repetitive transfer of kinetic energy.

We observed a clinical incidence (0.57) and a prevalence (54.1%) of injuries, predominantly occurring in the upper limbs, specifically in the shoulder, due to an acute overload mechanism, established at the time of training, resulting in removal, of severity and non-recurring. Studies included in this review were published between 2000 and 2019, with a higher frequency of publication from 2007, and by six different nationalities. Brazil, United States, Poland, South Africa, Rwanda and Iraq.

Regarding methodology, six studies consisted of cross-sectional descriptive studies[10,19,21,23,24,27], three in a prospective cohort[22,25,26] and only one in a retrospective cohort. Therefore, it was observed that among the included studies, only three meet the methodological recommendations of the current 'Declaration on research methods in sports injuries', indicating the performance of a prospective study, as it considers the injury a highly dynamic process[28].

After analysis, the studies showed medium quality, according to the STROBE and STROBE-SIIS statement (13.4 and 15.2, respectively). Among the main flaws identified are: only three of the studies cited methods to control

confounding, losses, or sensitivity[10,28,25] and a single article presented estimates adjusted for confounding variables and confidence intervals. Methodological diversity and biases found resulted in impossibility of developing a meta-analysis.

Table 3 - Body segment affected by injuries reported as percentages per study.

Study	Head/ neck	Upper limb	Trunk	Lower limb	Other
Nyland et al. (2000)*	-	41	13	27	14
Wieczorec et al. (2007)	8.7	43.9	26.1	21.3	0
Assumpção et al. (2007)	-	55	25	-	20
Molik et al. (2011)	-	68	12	-	20
Willick et al. (2013)	5.7	52.2	8	13.1	21
Souza et al. (2015)	10	70	20	-	
Derman et al. (2017)	10	51.9	8.4	13.4	16.3
Macedo et al. (2019)	14.7	16.6	37.3	31.4	-
Assuman et al. (2019)	1	75	7	14	3
Ghafour (2019)*	-	64.6	21.5	11.7	1.9
Average*	5.0	53.8	17.8	13.2	9.6

*The percentages in the article do not add up to 100%.

Table 4 - Diagnosis according to tissue reported as a percentage (%) by studies.

Study	Joint injury	Muscle/tendon injury	Bone injury	Skin lesion	Others
Nyland et al. (2000)	Does not specify diagnosis.				
Wieczorek et al. (2007)	48.9	51.1	-	-	-
Assumpção et al. (2007)	Does not specify diagnosis.				
Molik et al. (2013)*	-	14	20	22	27
Willick et al. (2013)	Does not specify diagnosis.				
Souza et al. (2015)	10	90	0	0	0
Derman et al. (2017)	Does not specify diagnosis.				
Macedo et al. (2019)	7.8	67.8	-	-	24.4
Assuman et al. (2019)*	49	3	2	10	35
Ghafour (2019)	15.6	25.4	-	13.7	45
Average	26.2	41.8	11	15.2	21.9

*The percentages in the article do not add up to 100%.

Table 2 - Epidemiological values and variables reported in each study.

Variables/studies	Epidemiological values		Mechanism		Time		Moment		Removal		Severity			Recurrent	
	Prevalence (%)	Clinical incidence	Overload (%)	Traumatic (%)	Acute (%)	Chronic (%)	Indefinite (%)	Training (%)	Game/ Competition	Others	Yes	Not	Minimum	Soft	Moderate	Severe	Other	Recurrent	Non-recurring
Nyland et al. (2000)	68,7	0,68	NI	NI	67	0	33	NI	NI	NI	NI	NI	NI	NI	NI	NI	-	NI	NI
Wieczorek et al. (2007)	100	1,04	100*	-	NI	NI	NI	NI	NI	NI	31,4	68,6	NI	NI	NI	NI	NI	NI	NI
Assumpção et al.(2007)	100	1,00	NI	NI	NI	NI	NI	100	-	-	NI	NI	58	0	25	17	0	NI	NI
Molik et al. (2013)	50	0,50	NI	NI	NI	NI	NI	51	43	6	64	36	0	0	0	100	0	NI	NI
Willick et al. (2013)	14,9	0,14	35	65	65	13	22	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Souza et al. (2015)	50	0,50	90	10	NI	NI	NI	40	50	10	60	40	0	0	30	30	40	60	40
Derman et al. (2017)	16,5	0,16	48,2	51,8	65,5	34,5	0	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Macedo et al. (2019)	58,2	0,58	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Assuman et al. (2019)	36,7	0,56	NI	NI	NI	NI	NI	52	48	0	NI	NI	22	NI	25	4	0	26	74
Ghafour (2019)	46,2	0,54	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Average	54,1	0,57	58	42	66	16	18	52	48	0	52	48	20	12	20	38	10	43	57

*Only injuries due to overload were analyzed.
NI: not informe.

As mentioned in the results, seven of the studies reported the definition of injury, but no article used similar definitions. The definition of injury varied in relation to the medical care regimen; absence from training/competition; and type of complaint. This variety of concepts created differences in the results and conclusions obtained in the studies, thus hindering comparisons between articles[28]. Focusing on consistency of definitions and methods in epidemiological studies of sports injuries, some groups of researchers have been working on consensus statements[28,29]. The last consensus defined injury as tissue damage or other derangement of normal physical function due to participation in sports, resulting from rapid or repetitive transfer of kinetic energy[29].

Our study confirms a higher frequency of shoulder injuries in sitting volleyball athletes. First, we must consider the characteristics of the sport, which mainly demands upper limbs for the execution of fundamentals and displacement, added to the transfer and elevation movements in everyday life for wheelchair players or crutch users[11]. The anatomical characteristics and the sport's gestures, which requires frequent elevation of the upper limb above 90° in most fundamentals, involving external rotation, abduction, and flexion followed by sudden internal rotation, adduction, and extension[9]. Additionally, the shoulder complex has the highest degree of mobility among the joints, performing wide movements at high speed and in all directions to meet the game requirements[27,30]. In a study that analyzed the shoulder complex, injuries were identified as being mainly related to: decreased system capacity to transmit tension; muscle weakness and imbalances; decrease in passive muscle stiffness; changes in muscle length; and undesirable scapular movements[30].

Regarding the injury mechanism, there is a higher prevalence of overload injuries (58%). One of the main points to be discussed in the modality is the overload on the upper extremities, which may be related to the fundamentals of the game and displacement. In addition, due to repeated actions during practice, there is significant fatigue in the triceps brachi, latissimus dorsi, and biceps, essential muscles in the execution of displacement and fundamentals. A previous study identified that 90% of injuries occurred due to overuse[10]. In addition, the occurrence of skin lesions may be associated with friction of body parts with the floor during displacement, in this way, the development of accessories or protective equipment should be oriented to minimize these hazards.

Regarding the time of injury variable in all studies, there is a predominance of acute injuries. It is observed that all studies reporting data on this parameter were multisports, referring to editions of the Paralympic Games. The reduced presence of this variable may be related to the greater need for medical follow-up and tests. When reporting data on sports injuries, it is essential to investigate the time at which the injury occurred, as the values of incidence, prevalence, risk, and rate vary if calculated during training or competition[31].

Regarding the moment, despite the predominance of injuries in training, the values were close, with a difference of 1% in relation to the time of the game. In training, the use of excessive and inadequate load increases injury risk, reduces physical conditioning and performance[32]. In contrast, athletes without adequate physical conditioning are susceptible to stress and overload, which interferes with sports performance[15]. In addition to the scarce competitive calendar, the lack of a regular physical conditioning program is evidenced as a factor associated with the onset of injuries[19].

To classify injuries according to location and diagnosis, several studies use cross tabulations, providing a large dataset, difficult to manage, and compromising information due to the excess of empty cells or minimal cases per category, a problem that is evident when analyzing the studies of our research [10,19,29]. In this review, we observed a lower occurrence of bone lesions, followed by skin lesions. Excoriation, abrasion, and laceration were mainly associated in regions in frequent contact with the ground during displacement or fall. These injuries often occur because of multiple friction forces acting on a specific area, causing pain and burning. If they do not receive proper treatment, they can progress to inflammation, infections, increasing severity, and days of absence[33].

Then, with greater occurrence, there are joint injuries. Studies document the presence of sprains and dislocations, mainly associated with falls or irregular movements with hyperextended wrists during the fundamentals of reception, defense and blocking; and ligament injuries to the proximal interphalangeal joints during blocking or reception. Finally, the most common diagnoses were associated with muscle and tendon injuries. Muscle injuries are the most frequent cause of physical disability in sports practice; these injuries are related to overexertion, resulting in muscle imbalances, which can generate abnormal movements and technical errors[23].

In the studies analyzed, most of the athletes needed to take a break temporarily, with a predominance of severe injuries. Monitoring the duration of the time loss is currently the most used way to report the severity of the injury[29]. In a study, a total of 669 days were lost with a more severe injury resulting in 54 days of absence for one of the athletes[26]. In relation to recurrent injuries, they cause a significantly longer median absence time compared to the first injury.

Recurrence data demonstrate a higher occurrence of nonrecurring injuries[10,26]. In a study for athletes affected by recurrent injuries, 60% reported being able to maintain their sports performance after treatment and 40% of players said they faced a decrease in the level of performance due to this recurrence. In this study, it was observed that

all recurrent lesions were classified as early[10]. Thus, it is essential that, when suffering an injury, the athlete respects the rehabilitation process and only returns to his competitive practice when fully recovered[34].

In the future, after careful planning and adoption of preventive measures (primary outcome), we will have a panorama of reduction in the prevalence and incidence of injuries, thus contributing to the development of the sport, safety at events, quality of life, and health of the athlete (secondary outcome). As a suggestion for future studies, we mention the production of reports and the monitoring of sports injuries, in a single modality format, conducting cohort studies allowing dialogues between injury and risk factors, and using validated and specific questionnaires for paralympic sport to reduce bias. Finally, we hope that this review will materialize in practice beyond scientific production, establishing its applicability based on the multidisciplinary team working in the sport and helping decision-making about planning.

5. Conclusions

Therefore, in the study, we identified a prevalence of 54.13% and a clinical incidence of 0.57 injuries. Regarding the variables observed, we identified a predominance of acute injuries, overload mechanism, occurrences of injury at the time of training, and the need to withdraw from sports practice. However, most of the injuries were classified as severe and non-recurrent. Regarding location, complaints were more frequent in the upper limbs, the shoulder being the region of the body most affected by injury, and, finally, the occurrence of muscle/tendon injuries prevailed. We hope that the epidemiological aspects documented in this review may initially contribute to the development of preventive and control measures, technical guidance, physical preparation, logistics at events, medical care, and the development of protective equipment. For example, we observed that amputee athletes have the hip joint as an important strategy to maintain dynamic balance and stability, but they constantly present a reduction in the strength of the abductor and extensor muscles and the appearance of bilateral strength asymmetry. With this information we can propose a constant physical assessment including dynamometry and unilateral muscle strengthening work.

Regarding information on sprains, these can support proprioceptive work and muscle control, which are fundamental to dynamic joint stability. The overload of the upper limbs involved in a dual role in sports should support the planning of load control and recovery. The appearance of skin lesions associated with friction movements during displacement caused withdrawal from training. This fact can be the basis for the development of accessories or protective equipment.

Finally, we hope this review will go beyond a scientific production, establishing its applicability in a multiprofessional team working in the sport and assisting in decision making in the planning phase. In addition, we believe we have developed a comprehensive source of information on the modality, which should be extended to the knowledge of athletes to make them aware of the importance of this sports injury surveillance process for their safety and sports performance.

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