Prevalence And Related Factors Of Injury Among Handball Players Of Brazzaville During The Sports Season

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Abstract: The objective of this descriptive study is to estimate the prevalence and associated determinants of handball physical trauma in a sample of players. It was conducted with 75 practicing handball players in 5 clubs whose average age was 26.4 4.7 years of the players surveyed. The body mass and size of the handball players were measured using an XY-3012 electronic scale. A multi-pronged questionnaire was conducted with results showing a predominance of pelvic limb injuries, including knee (26%) and ankle (24%). However, the shoulder made up of the scapula and collarbone) and the wrist are the joints, the most exposed to physical trauma. Our study identified the most frequent injuries as well as the predominant factors responsible for the physical injuries that occurred during handball competitions. With a view to improving performance and reducing the number of accidents involving Congolese handball players, it is desirable that the public authorities modernise the working conditions of athletes by lining the handball fields with tartan or floor.

Key words: handball players, physical trauma, prevalence, sports season.

Introduction

For several decades, beyond performance and victory, the sense of show has become increasingly important in high-performance sport. Handball is one of the most popular sports in the world. This is justified not only on the evolution of the parameters of sports performance, but also on the effectiveness of the nature of the game where the efforts become more and more intense. The handball is characterized by intermittent exertions with accelerations, changes of direction, sprints, jumps, shots, short, slow races, steps, duels with the appearance of wrestling [6],[15]. The distances covered during a handball match can reach 5026 meters depending on the position and the genre. Recent changes in handball regulation contribute to a faster pace, with a decrease in time lost between phases [9]. The current handball is also characterized by intense efforts and repeated violent actions in a very short time interval. The tactical factors of the games push to an increase of the physiological requirements of the handball players. In other words, this ball transfer and receiving game accelerates the game. It leads players to run more than their limits. This leads to increased energy expenditure and the risk of injury. This situation caught our attention, hence the purpose of this study. Today, there are several types of injuries that occur during games in the literature. They are located at the knee, ankle and finger level. According to one study, 17% of these injuries occur in the knee, 18% in the ankle and 13% in the fingers. This study showed that lower limbs represented (52%) of injuries during 1000 hours of practice in the National Team. Knee injuries were (8%) [14]. Between January 2007 and December 2013, 409 athletes were operated on because of previous instability. Four patients suffered from subluxation and five from glenohumeral dislocations. Of these, nine patients (2.1%) were involved in handball. The pre-operative radiographic examination of the front shoulder included three rotations (neutral, internal and external) as well as the glenoid profile [4]. A humeral notch was presented in five out of nine cases, and a glenne bone lesion in seven out of nine cases. Handball is an activity that requires players to disrupt the opposing team during actions: attack/defense. And in return, reduce motor disturbance. To achieve this, high-speed activities are required to create the element of surprise [11], [5]. Apart from speed, other qualities are necessary to achieve this. Basically, players must have good physical fitness, especially lower limb power, support to deal with brief actions (sequence of support actions and support blockages, stops, changes in direction). However, his brief actions are not the same depending on the position held; causing trauma that can greatly influence the performance of the players. The quest for performance is the goal for the team and the athlete by pushing the athlete to try several actions in defense and attack. Thus, the accomplishment of his various actions does not exempt or spare the athlete from microphones or macro traumas. In Congo, the practice of handball has increased in recent years with the increase of teams and practitioners. Unfortunately, the lack of an action plan to improve the quality and effectiveness of handball affects the health of players who are injured during championship training.

Several aspects can be at the origin of the occurrence of their different traumas. We know that the lack of medical follow-up is pointed at. We also index intrinsic factors (age, gender, and occupation), extrinsic factors (training, flooring, wearing the knee pad) and factors specific to handball. Need to conduct studies on the prevalence of trauma and related factors of handball traumaHowever, epidemiological studies of injuries and their prevention in handball are almost non-existent. It is in this perspective that this epidemiological study focuses on the prevalence of trauma in handball players and the associated factors. This leads to the questions listed as follows:

Main question:
- What is the prevalence of trauma among Congolese handball players?
Secondary questions:
- What is the percentage of injuries experienced by handball players by position?
- What is the percentage of injuries by anatomical location?
- What is the percentage of injuries experienced by handball players by position and gender?
- What are the intrinsic and extrinsic factors associated with different traumas?
Hypotheses:
1) Cases of handball injuries are higher among women than men.
2) Age, gender, poor warm-up, flooring, kneepad wearing and contact and play-station constraints are the predominant factors responsible for handball injuries.
General objective:
To report on the trauma during handball games in Brazzaville.
Specific objectives
• Estimate the prevalence of the various traumas that occurred during handball championships among men handball players and Women handball players from Brazzaville teams;
• identify the factors associated with these injuries

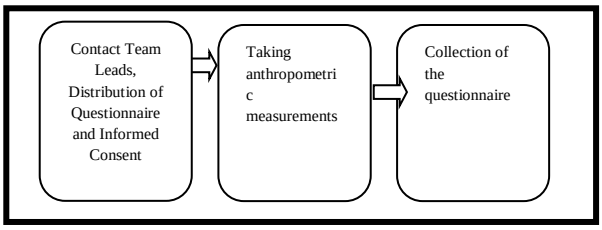

Figure 1 : *Plan de l'étude.*

I. Materials and Methods

1. Study Protocol.
This prospective study was conducted among Brazzaville handball players from August 2018 to March 2019. Three stages constituted the protocol of this study: one week before the measurements, contact with team leaders and athletes to inform them of the objectives and approach of the study and distribution of the questionnaire and informed consent. Anthropometric measurements were taken 72 hours prior to the collection of the questionnaire completed by the participants (Figure1). Free and informed consent, written by each participant, was obtained for their participation in the study. The data were collected anonymously, in accordance with The data were collected anonymously, in accordance with the Helsinki Declaration.

2. Participants
The study involved seventy-five (75) players from the two handball versions of the Brazzaville teams competing in the National Elite Championship. This sample was composed by the following clubs: Étoile (31 players including 13 men and 18 women), DGSP (16 players), ABO sport (8 players), Caiman (11 players) and Diable noir (09 player Participants were selected using the random method and the three-stage cluster technique. To be included in the study sample, the following criteria had to be met:

- Be a player on a handball team recognized by the federation for at least two years;
- Have participated in elite championships organized by the league or federation;
- Under 35 years of age at the start of the study;
- The hourly training mass of his players was between 6 and 10 hours.

3. Variables studied

3.1. Independent variable.
The independent variables were the different games, age and sex.

3.2. Dependent variables
The dependent variables were: the various cases of trauma identified.-

4. Measures
The body mass and size of handball players were measured with an XY-3012 electronic scale (Camry, China) and a 206 M wall cloth (Seca-Bodymeter, France) measured to the nearest millimetre.

Questionnaire
The survey was conducted using a three-part questionnaire: the first was on socio-demographic characteristics (identification number, given names, age, gender, level of education and number of children); The second was for anthropometric data (Size, Body Mass, Body Mass Index and Abdominal Perimeter). The third was a self-questionnaire, completed by the players surveyed and consisting of two parts: the first part concerned handball practice (Level of practice, length of time in practice, number of training sessions per week, average length of training sessions). The second was related to injuries during handball practice.

5. Statistical analysis.
The analyses were performed using the R software. The quantitative values were presented as a mean and standard deviation. And, the qualitative values were presented as absolute frequencies, followed by their percentages. Significant differences in prevalence were calculated using the chi-square test. Differences in anthropometric and bodily data were tested by the test, Test of Student not Matched. Logistic regression models with odds ratio (OR) calculations and corresponding 95% confidence intervals (CI) were used to examine the possible association of independent variables

and trauma (dependent variables). Multivariate analyses taking into account the simultaneous effect of all explanatory variables were also carried out. The level of significance for acceptance was p0.05. To measure the degree of association between obesity and the factor studied, the odd ratio is used.

II. Results

The results of this study examine anthropometric characteristics, the prevalence of trauma in Brazzaville's junior and senior handball teams, and the factors associated wit

Table 1: *Anthropometric Characteristics of Surveyed Players*

	Total Effective (n = 75)	Woman (n = 42)	Man (n = 33)	p-value
	Average ± SD	Average ± SD	Average ± SD	
Age (ans)	26,4± 4,7	26,8± 5,1	25,9±4,3	0,37
Height, Tall (cm)	173,0± 0,1	169,9±0,1	176,9±0,6	0,59
BM (kg)	69,4 ±11,1	68,8±11,1	70,3±9,9	0,22
BMI (kg/m^2)	22,9± 3,7	23,7 ±3,0	21,9± 4,4	0,87
WC (cm)	77,6 ±10,1	77,5 ± 11,5	78,4± 6,7	0,34
NYP	10,1 ± 5,1	9,9 ± 5,5	25,9±4,5	0,21
VWH	2±0,0	2 ± 0,0	2 ± 0,0	

BM: body mass; BMI: body mass index; WC: waist circumference; A: Average; SD: standard deviation; NYP: number of years of practice; VWH: volume of weekly hours. The mean age of the surveyed players was 26.40 4.7 years with average body weight, height values of 173.0 0.1 cm and 69.4 10.6 kg respectively. The median BMI and waist circumference were 22, 9 3.7 kg/m2 and 77.6 10.10 cm. Regardless of the values recorded, no significant differences were observed between the two sexes.

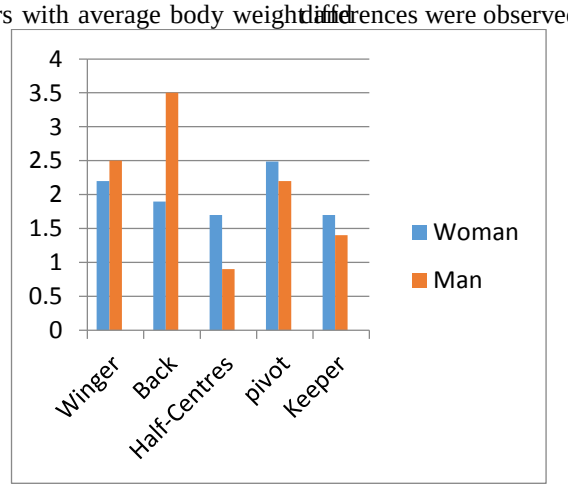

Figure 2: *Distribution of Players by Positions Occupied*

This study shows that the percentages of posts: Winger and Back occupied by men are higher than those occupied by women. This explains why men occupy more of these positions. While the ladies occupy more of the following positions: Semi-center, Pivot and Guardian.

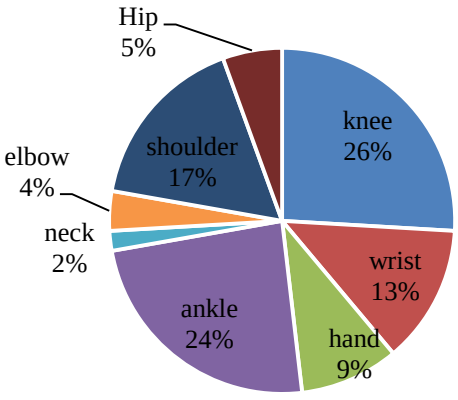

Figure 3: *Percentage of injuries by anatomical location*

The anatomical location of the injuries shows a very **clear** predominance in the pelvic limbs, particularly the knee and then the ankle. Next come the shoulders and wrist which are the predominant joints in trauma of the scapular limbs. Knee injuries account for more than 26%; ankle 24%. The neck and elbow are the least affected joints with frequencies of 2% and 4% respectively.

The distribution of trauma by position indicates that the most exposed position is the rear position followed closely by the wingers. Half-centres are the least exposed in men. In the ladies, the pivot position is the most accentogenic followed by the keeper and the rear position is the least expose

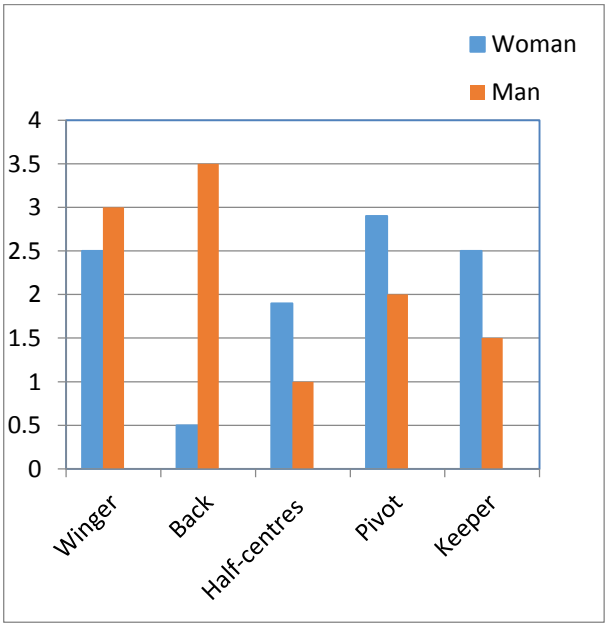

Figure 4: *Distribution of Trauma by Occupation and Gender*

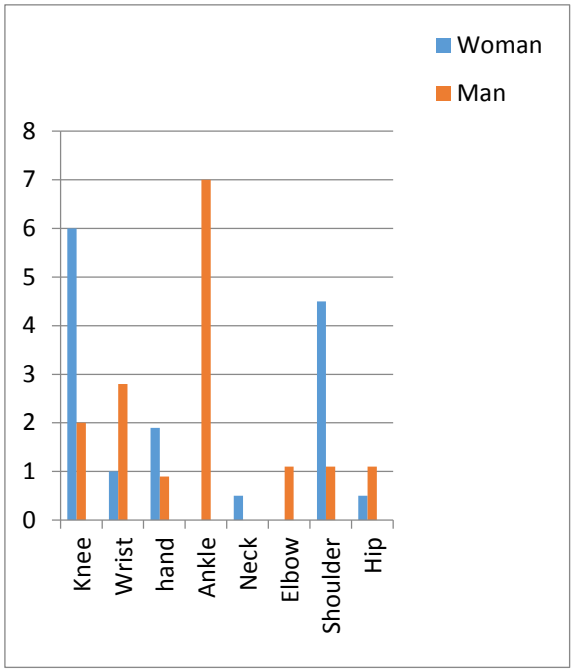

Figure 5: *Percentage of injuries by location and sex.*

This plot of the percentages of injuries by location and sex shows that ankle injuries in males are the highest of all injuries in both versions (female and male). These percentages are followed by those of the knee and shoulder in women. There are also identified injuries with a small percentage and, occurring only in a specific sex and in a specific location such as: the neck with a percentage of 2% suffered by the ladies; elbow with a 4% percentage occurred in men.

Table 2: *Univariate and multivariate models of intrinsic factors associated with trauma to handball*

Age	Not traumatized (n=38)	Traumatized (n=37)	OR raw (IC à 95%))	OR adjusted (IC à 95%)
25 years and over	26	20	1,00	1,00
Under 25 years old	12	17	2,00 (0,77-5,41)	1,85 (0,64-5,54)
Sexe				
Women	25	17	1,00	1,00
Man	13	20	0,23 (0,07-5,41) **	0,18 (0,05-5,57) **
Position held				
Rear	21	25	1,00	1,00
Fronts	13	5	0,53 (0,16-1,60)	0,40 (0,10-1,44)
Guard	4	7	1,47 (0,38-6,25)	1,88 (0,44-8,97)

OR : odds ration; CI: 95% confidence interval; n: effective;* p <0,05 ; ** p <0,01 *** p <0.001

Tableau 1: *Modèles univarié et multivarié des facteurs extrinsèques associés aux traumatismes au handball*

	Not traumatized (n=38)	Traumatized (n=37)	OR raw (IC à 95%)	OR ajusted (IC à 95%)
Warm-up				
Done well	35	11	1,00	1,00
Insufficient	3	26	19,73 (18,85-20,87) ***	18,00 (16,20-21,08) ***
Floor covering				
Cement	30	23,7 ±3,0	21,9± 4,4	0,87
Tartan	4	77,5 ± 11,5	78,4± 6,7	0,34
Wearing of knee braces				
Yes	4	5	1,00	1,00
No	34	32	1,77 (0,87 – 42,94)	12,79 (1,91-25,90)*

OR : odds ration; CI: 95% confidence interval; n: effective;* p <0,05 ; ** p <0,01 *** p <0.

III. Discussion

The discussion of this study is based on the relevance of the methodological choice and the results obtained. The objective of this study was to estimate the prevalence and associated determinants of handball injuries. It was conducted with a limited population of 75 practitioners in 5 clubs including: eleven (11 men) for caiman, DGSP (16 ladies), Étoile (31 including 18 ladies and 13 men), Diable noir (9 men) and ABO (8 ladies). The choice of these teams is justified because of the geographical situation and the resumption of training sessions after the sporting holiday. The sample was selected using the random method. It is important to note that this study is intended to be descriptive and concerns a sample of 75 young handballers and cannot therefore be representative and generalized to all handballers in Congo. A larger study would be welcome and would thus allow a larger scale, the possibility of producing statistics, and in particular to study the correlations between the various variables collected. The average year-to-year age of the surveyed players was 26.4 4.7 years with average body size and mass values of 173.0 0.1 cm and 69.4 10.6 kg respectively. The BMI and waist circumference medians were 22, 9 3.7 kg/m^2 and 77.6 10.1 cm. The average number of years of practice is 10.1 5.1 and the weekly volume of hours is 2 0.0. Among these participants were 36 (85.7) right-handed and 6 (14.5) left-handed women. Among men, 28 (84.8) right-handed and 5 (12.1) left-handed.

Study Limitations

Some limitations are worth noting in this study. This cross-sectional study presents only one snapshot of the phenomenon studied. The use of the questionnaire by respondents may or may not yield reliable results. In addition, the nature and reasons for these physical injuries were not identified by practitioners given the lack of medical follow-up.

Results Recall

For all 75 players surveyed, the incidence rate for those with physical trauma was 49%. With respect to the anatomical location of trauma, the results of this study showed a predominance of the lower extremities, specifically the knee, representing 26% and the ankle 24%. Also, in the upper limbs: shoulders, specifically the scapular arteries and wrist. At the foot level, tarsus and metatarsals are frequently traumatized. The neck and elbow are the least affected joints with frequencies of 2% and 4% respectively. The percentages of our results are high compared to a study carried out in France which showed that the knee joint was the most affected (24%) in front of the ankle (23.2%). [3]. The same is true of the results of the study of [12] for their location, there is an average of 37%. Leg with (24%) and knee (21%) are the most affected; the predominance of physical trauma at the knee level can be explained by the fact that, in most cases, the player's calling foot is injured. In fact, the joints of the pelvic limbs, lower part, are highly stressed in the handball players, especially because of the game movements of this sport of pivots: changes of fast directions, fakes in double supports. The various traumas occur depending on the position occupied during the game. Our results revealed that the most exposed position is the right and left rear (35%) followed very closely by the wingers (30%). Half-centres with central rear are least exposed in males (10%). Among the ladies, the post of the pivot and the keeper (29.5%) are the most uneven. The posts of goalies and wingers collect (23.5%). The rear station is the least exposed (5.9%). The sports medicine magazine [3] published on the subject: the technical and physiological characteristics required for each position. When it comes to play phases, the rear use their shoulders a lot and only pull twice as much as the pivot and wingers. On average, 48,000 shots are fired per season for a professional handball player. We know that the upper limbs of handball players are very much in demand. The rear is the one who practices the most passes and performs fewer pivots. But, he is more in duel with the opponent. The pace of running is highest for the rear and wings [1]. Next, the actions are varied: from low, moderate to high. We note logically that the guardian is the one who has the most actions with low rhythmic intensity. On the other hand the rear and wings are often at a high pace. The winger position requires more rhythm, and in the end, the changes in the course of the game involve the rear and centre positions for the most part. These averages are explained by the over-solicitation in the game, previously explained. This is confirmed by statistics from the 2012 European Championship where only 9 players played more than 90% of the total time during the entire competition. 14%s% of players played more than 75% of the time. 25% of players played between 75% and 50%. 34% of players played between 25% and 50% of the time and 28% of players played less than 25%. These results are interesting and show the extent to which replacements are necessary in view of the different phases of games required by some players. No studies exist on the effect of fatigue development in handball. It describes by position, the qualities required in terms of reinforcement, speed, metabolism, and injury prevention. It was noted, for example, that wingers need to work more on their explosivity to fulfill their jumping and sprint function. The ideal for players is the development of the aerobic system which is the best to meet the endurance abilities. In terms of prevention, it is recommended for the

rear to work especially their rotator cuff due to the large number of passes and shoots they make. The pivots must concentrate on the muscles of the static, of the trunk, so as to support the contacts suffered in the area. The wingers focus more on the schuss jambiers to prevent muscle tension that can happen during sprints. Finally, guards need to strengthen the shoulder and elbow muscles, especially to protect their joints so that they can react to a reflex stop.

Associated Factors

Intrinsic and extrinsic factors are relevant to this study. The results were influenced by these factors. In terms of intrinsic factors, the results show significant decline in trauma. Statistics show that some trauma is associated with gender. (OR = 0.23) (Table II). For extrinsic factors (Table III), these results also showed a significant correlation with heating (OR = 19.73), flooring (OR = 0.34), and wearing of the knee brace (OR = 12.39). Gender is a factor to consider. The rate of physical trauma is lower for women compared to men in the same sport. The reasons advanced are hormonal, biochemical, morphological and the realization of the sport gesture. However, the practice of men's handball is more physical than that of women's handball. It relies on the contact, the direct confrontation while the female handball avoids the physical clashes. Players change directions frequently. This specificity of the game explains the difference in the rate of physical trauma between female handball and man handball. Without distinction of sex, the age of the majority of handball players who suffer physical trauma is 25 years and older. A study was conducted by [7] on the age factor of different participants: all sports combined. This study shows that, from 17 to 45 years of age, the body does not react in the same way. These organs: integumentary, bony, articular, muscular, nervous, cardiovascular, respiratory no longer have the same properties during the life of the individual. Tendons and ligaments become shorter and more fragile. Cartilage wears out over the years. This explains why older people are most exposed to fractures during contact and violent confrontation. Of the thirty-nine (39) players who experienced physical trauma, 28 said they were not well warmed up. The other 11 said the opposite. We can also say that non-compliance with training principles can cause physical trauma in players. A study has shown that the risk of rupture of the L.C.A. is higher in a game than in a handball practice [13] which has also been highlighted in other disciplines such as rugby or football [8] ,[10]. In terms of floor covering or not, 69 players were physically injured. Only 11 victims were identified, training on a tartan playground. The remaining 57 victims practice on a cemented surface. We can point out that the material of the floor covering affects the exposure or not of the physical trauma of the players. Also, while adherence of courts to athletic footwear improves athletic performance, it increases the risk of sporting accidents. [14] demonstrated that playing sports on artificial floors increased the ri14sk of sports accidents compared to those on wooden floors. Finally, thirty (30) handball players who have been physically injured claim that they have never worn the knee brace while wearing the knee brace. This resulted in the highest rate (26%) of physical injuries to the knee. The knee pad is used to cushion impact during falls. It also helps to limit the physical trauma to the knees caused by knee friction with the ground during a slip. It facilitates a better glide in the practice of sliding sports. [2]. In short, among all the factors listed, we can also mention the factors specific to handball. They are nothing but contact constraints. This requires avoidance of contact and respect for the opponent, which is not always observed by the players. The rules of the game are regularly reviewed internationally to mitigate the risk of injury. The latest revision of these rules, concerns the release of the goalie. If the latter leaves and touches an opposing player during the conquest of the ball, he is disqualified. This rule was enacted following serious physical trauma. Also, respect for the opponent also prevents injuries. Aggressive and disloyal behaviour is responsible for physical trauma in sports involving 23% to 33% of accidents [2].

Conclusion

Our study identified the most frequent injuries as well as the predominant factors responsible for the injuries that occurred during the national and municipal championships held in Brazzaville in 2018. With regard to the anatomical location of the injuries, the results showed a very clear predominance in the pelvic limbs, particularly the knee with a percentage (26%) versus the ankle (24%). The scapular limbs, including the scapula and collarbone and the wrist, are the joints that suffer a great deal from physical trauma. The non-port of the knee brace (OR=12, 39), the poorly conducted heating (OR=19, 73) are elements, the most associated with the trauma studied. However, the ''male' genders (OR=0.23), the wearing of the knee brace and the tartan floor covering (OR=0.34) were protective factors for these injuries. In order to improve performance and reduce the trauma of Congolese handball players, it is only desirable that: the leaders of the Congolese Handball Federation should improve the working conditions of the players starting with the nature of the pitch (covering the cardboard floor instead of cement); recruit qualified medical personnel for the best follow-up of handball players; coaches should advise practitioners on the wearing of knee pads to secure the knees.

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