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Leg Injuries by Firearms in Kisangani: Epidemiological, Clinical, Ballistic and Anatomopathological Aspects

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Abstract

Context: This article presents leg injuries caused by firearms in their epidemiological, clinical, ballistic and anatomopathological aspects. Leg injuries from firearms are no longer the preserve of war. Indeed today, they are frequently found in civil practice affecting the most disadvantaged social classes, who pay the heaviest price. The objective of this work was to identify the epidemiological, clinical, ballistic and anatomopathological aspects of traumatic leg injuries caused by firearms in Kisangani. **Methods:** This is a retrospective study carried out in 6 reference hospitals in Kisangani: The University Clinics of Kisangani, the General Reference Hospitals of Kabondo, Lubunga, Makiso as well as the Military Hospital of the 3rd zone of defense and the reference military health center of the Lokosa training center. The sample consisted of 117 injured people with documented firearm leg injuries. Our data collection technique is a documentary analysis based on patient medical files, consultation registers, operating, anesthesia and hospitalization reports from the departments. These data were entered with Excel 2013 then imported to IBM SPSS version 20 for analysis. **Results:** From January 2019 to December 2023, we recorded 3572 trauma patients, among whom 308 patients had ballistic trauma, *i.e.* a hospital frequency of 8.62% of cases and 117 cases of ballistic leg trauma, *i.e.* 37.99%. With a male predominance (76%), *i.e.* a sex ratio of 3/1 in favor of the male sex. The age group of 22 to 32 was the most common in

49.57% of cases. The average age of our injured was 29.88 years with a standard deviation of 12.28 and extremes minimum 7 years and maximum 78 years. Pupils and students were the majority (29.06%). The majority of injured people (71.79%) had lesions with entry and exit orifices without a retained projectile. 66.67% of injured people were hemodynamically stable. The left leg was the most affected (47.86%). Of all these injuries, 58.12% were open fractures. The majority of fractures are complex (69.57%). Fractures of the bones of the leg concerned more than a third proximal (55.07%). Most of these fractures (44.93%) are type IIIB according to the GUSTILO and ANDERSON classification. The majority of leg lesions (52.14%) were isolated without any lesion association. **Conclusion:** Leg injuries from firearms pose a serious public health problem and constitute a daily and alarming concern in developing countries due to their increasingly frequent occurrence, their high cost of care and complications, disabling effects that they cause. Therefore, as for war doctors, the diagnosis and treatment of these injuries must be mastered by all healthcare personnel working in civilian practice.

Keywords

Leg Injuries, Firearms, Ballistics, Anatomopathology

1. Introduction

Traumatic firearm injuries are common and varied. These may include associated or isolated ballistic injuries to the head, thorax, abdomen or limbs. Among the latter, it is necessary to distinguish leg injuries caused by firearms.

They are the consequence of the penetration into the body (leg) of a projectile (bullet, lead) or a metal fragment coming from the casing or contents of an explosive device (grenade, mine, shell, bomb). Due to their profession, the military is particularly concerned by the problem of firearm injuries [1] [2].

Leg injuries from firearms are injuries more frequently encountered in modern conflicts, even among soldiers equipped with shrapnel vests that leave the limbs exposed. These lesions are characterized by their hyper septic side. Their treatment is unequivocal, it is surgical trimming. Antibiotic therapy, although necessary, is not sufficient. The multiple harmful agents are not always radiopaque [3].

They constitute a real public health problem in several countries, especially developing ones [4].

Studies carried out after the Second World War by RIGAL attest that out of 37 injuries to the lower limbs by explosions of antipersonnel mines, there were 24 injuries to the foot (22 anterior injuries and 2 posterior injuries); 13 leg injuries (4 amputations due to disappearance of the foot, 9 broken legs) [5].

Indeed, whatever the ballistic trauma, one constant remains: studies of the effect of a projectile on the human body are essential for improving the understanding of the injurious effects of a weapon and especially for the development of means of protection. They can also make it possible to fear and seek certain effects

from a distance. On the other hand, they are less immediately useful for the management of these injured people which is based, both for the anesthetist-resuscitator and for the surgeon, on clinical and biological findings, more than on extrapolations on the vulnerating agent. LINDSEY's well-known and common-sense sentence remains relevant today and could simply, to adapt to these new facts, be written today: "let's continue to treat the trauma and not the weapon" [6].

War surgery differs from surgery performed in civilian trauma. For the first, the goal is to save life, to save affected limbs, to avoid infectious complications, to minimize disabling after-effects [7] [8].

Leg injuries from firearms most often occur in the context of multiple injuries (10% - 30% of cases), multiple screening of the limbs, multiple aggression, multiple trauma or complex injuries [7].

They therefore frequently pose both a problem of treatment of the soft parts and fixation of the fracture site; they involve the functional prognosis and the vital prognosis can be compromised due to the associated lesions [9]-[11].

Leg injuries from firearms are no longer the preserve of war. Indeed today, it is adolescents and young adults from the most disadvantaged social strata who are paying the heaviest price.

These traumas are responsible for a considerable financial burden on society, amounting to billions of dollars [12].

Leg injuries from firearms represent a particular challenge for any surgeon in general, due to the possible simultaneous penetration of several compartments (soft tissue, bone tissue), the diagnosis of their involvement and their surgical management if necessary.

Data from epidemiological surveillance of the armies from 2004 to 2010 show that the most frequent injuries were to the limbs with 36.3% of leg injuries [13].

Still within the French cohort during its military intervention in Afghanistan, the main anatomical region affected was also the limbs in 67.1%, including 42% leg injuries [14].

A study carried out in Brussels in 2017 by FABECK concluded by saying that with regard to gunshot wounds to limbs; isolated leg wounds occupied second position with 20% of cases (after those of the thigh) and 36% concerned shin fractures [15].

DJOUBALO TRAORE, in his study carried out in Mali from 2012-2019, found that in the etiologies of leg fractures, those caused by firearms represented a significant frequency of 8.10% [16].

Still in Mali in 2022, leg injuries from firearms represented 15.9% [17].

In Morocco in 2020, leg wounds represented 23% and 2 out of 13 cases of tibia fractures were treated with an external fixator (orthofix) [18].

This high frequency of leg trauma by firearm in civilian practice unfortunately contrasts with the scarcity of publications relating to it. Data on firearm injuries in military practice are difficult to apply to firearm injuries in civilian practice, because significant differences exist in terms of injuries, ammunition and weap-

ons used, harming potential and finally objectives assigned to military and civilian armaments.

Over the last thirty years, our country, the Democratic Republic of the Congo, has been the scene of conflicts of all kinds with the consequences of the increased and uncontrolled use and circulation of firearms with an increase in the number of victims; which situation has not spared the various cities of the country.

This is how in Bukavu, one of the cities in the EAST of the DRC in the grip of war; KIKOBIA SAMBILI, in his research carried out in 2012, found 28.3% of firearm fractures which involved the leg bones [19].

In Lubumbashi, studies carried out by ILUNGA between 2018 and 2019 found 6.82% of leg bone fractures of ballistic origin [20].

The city of Kisangani is not spared, after having been the epicenter of permanent armed clashes between the Ugandan and Rwandan armies, continues to experience the phenomenon of armed bandits resulting daily in civilian victims. These constitute a particular group of those injured by firearms outside of war; which are generally treated in the various large health structures in Kisangani.

Which leads us to ask ourselves the following questions: What is the prevalence of leg injuries from firearms in Kisangani? What are the ballistic factors involved in the production of these lesions? What are the clinical and pathological particularities of these lesions?

This is how we set the following objectives: General objective: it aims to identify the epidemiological-clinical, ballistic and anatomopathological aspects of traumatic injuries to the legs by firearms in Kisangani; Specific objectives: Determine the ballistic characteristics of the damaging agents causing leg injuries by firearms, analyze the means of diagnosis and the anatomopathological characteristics of leg injuries by firearms.

2. Methodology

Our study is multi-center and took place successively in the surgery department of the University Clinics of Kisangani (CUKIS), in the general surgery departments of the general reference hospitals of MAKISO/KISANGANI, LUBUNGA, KABONDO, the hospital reference soldier of the third defense zone of Kisangani (HM3ZDef) and the LOKOSA Reference Health Center. It focused on 308 subjects with firearm trauma admitted to these services.

This was a retrospective, descriptive and cross-sectional study carried out over a period of five years (January 1, 2019 to December 31, 2023). With an exhaustive sample (consisting of all patients presenting ballistic leg trauma during this study period). It was made of 117 people who had suffered leg injuries from firearms. The minimum sample size was calculated by the SCHWATZ formula: $N = t^2 (p (1 - p))/M^2$ where N = Sample size, t = 95% confidence interval (standard value of 1.96), M = margin of error of 5% (standard value 0.05), p = Estimated prevalence of leg wounds caused by firearms in BAMAKO which is 8.10% according to a study conducted by DJOUBALO Traoré [16] (Djoubalo, 2019). This prevalence

was chosen because this author's study was carried out under conditions similar to ours. That is to say, BAMAKO is a city prey to terrorism and armed banditry. So the minimum size calculated was 112 patients.

The sociodemographic, ballistic and anatomopathological data of these lesions were studied: Overall frequency, sex, age, profession, origin, level of study, place of the event, circumstance of occurrence of the trauma, time between the event and the admission, means of evacuation of the injured.

The ballistic aspects focused on: type of weapon used, type of ammunition, projectile retained. And the anatomopathological aspects retained are: Type of fracture line, site of line, classification of fractures according to G-A, associated lesions.

Were included in our study, all trauma patients with leg injuries from firearms isolated or associated with other injuries, admitted, treated and followed in the aforementioned hospitals and those with complete files including anamnestic elements and clinical data defining a leg injury by firearms. Not all patients admitted during the period of our study for ballistic trauma without leg injuries from firearms and with incomplete medical records were included in this study.

Our data collection technique is documentary analysis. Data were collected from patients' medical records, consultation registers, operating reports, anesthetists' and hospitalization reports from the departments.

Each patient had a file in which all administrative, clinical, diagnostic and therapeutic data were recorded. The information collected was recorded on individual survey sheets. Given the retrospective nature, we did not review the patients for evaluation.

Data entry and analysis were carried out using IBM SPSS version 20 software.

Word processing and tables were carried out with Microsoft Word 2017 and Excel 2017 software respectively. And we thus calculated the frequency, the mean and the standard deviation.

3. Results

3.1. Epidemiological Aspects

From January 2019 to December 2023, we recorded 3572 admissions for trauma of various etiologies, including 308 patients with ballistic trauma, *i.e.* a hospital frequency of 8.62%, and 117 cases of ballistic leg trauma, *i.e.* 37.99% (**Figure 1**).

The age group of 22 to 32 was the most common in 49.57% of cases. The average age of our patients was 29.88 years with a standard deviation of 12.28 and extreme minimum 7 years and maximum 78 years (**Figure 2**).

The male sex constitutes the majority of our injured in 76.07%, *i.e.* a sex ratio of 3/1 in favor of the male sex (**Figure 3**).

Pupils and students were the majority with 34 cases or 29.06% and farmers occupied last place with only 3 cases or 2.56% (**Table 1**).

Most of the patients came from the commune of Lubunga in 36.75% followed by those from the commune of Makiso in 20.51% (**Figure 4**).

It follows from this figure that the majority of injured people had secondary education in 45.30% of cases and only 6.84% were illiterate (Figure 5).

Diagram 1 shows that the majority of trauma victims with 53 cases or 45.30% had been injured on the street.

The majority of our injured were admitted within 6 hours of the trauma (73.50%). With an average of 1.44 hours of time elapsed between the occurrence of the trauma and admission to hospital (Figure 6).

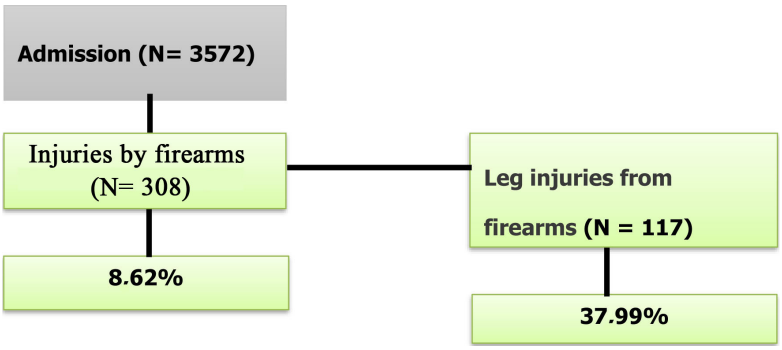

Figure 1. Global frequency.

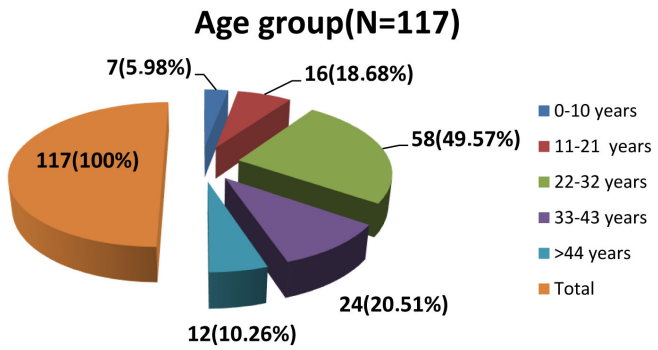

Figure 2. Distribution of injured people according to age.

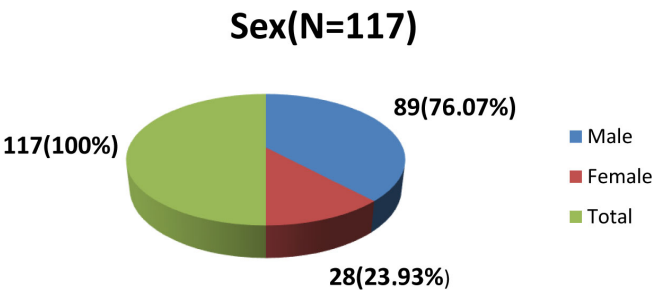

Figure 3. Distribution of cases by sex.

Table 1. Distribution of cases according to profession.

Profession	Frequency	Percentage
Pupil and student	34	29.06
Military	25	21.37
Policeman	7	5.98

Continued

Trader	12	10.26
Biker and Driver	10	8.55
Teacher	5	4.27
Housewife	5	4.27
Hunter	10	8.55
Unemployed	9	7.69
Total	**117**	**100**

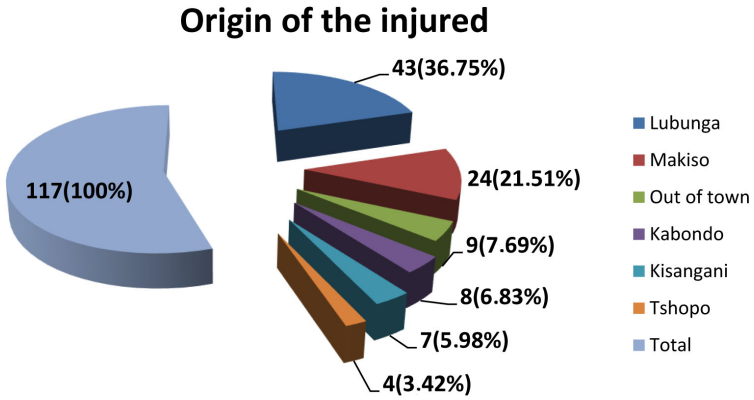

Figure 4. Distribution according to origin.

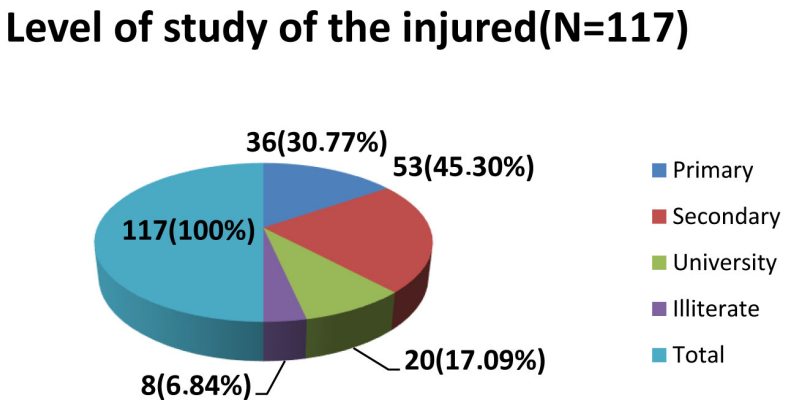

Figure 5. Distribution of cases according to their level of study.

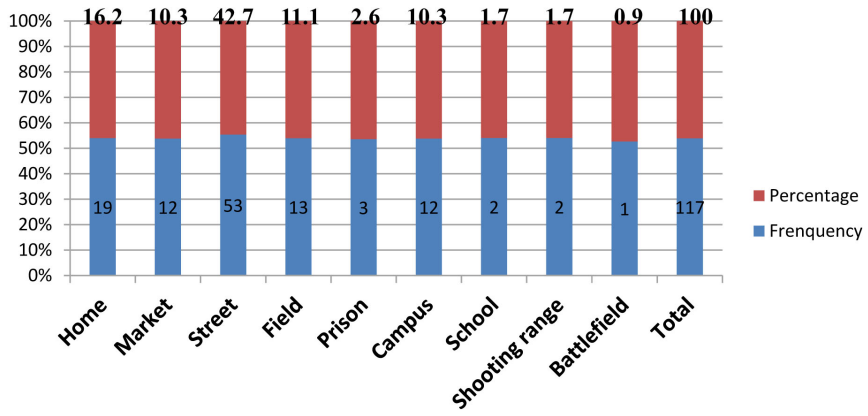

Diagram 1. Distribution of cases according to location of event.

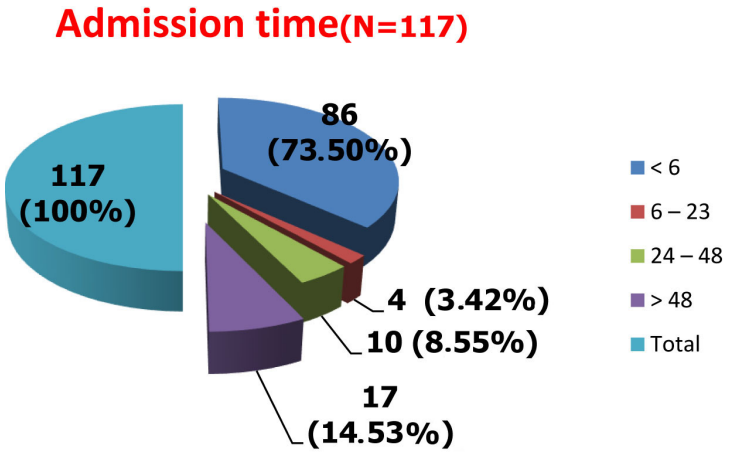

Figure 6. Distribution of cases according to hours of hospital admission.

It appears from Table 2 that the fight between law enforcement officers and the civilian population caused the greatest number of injuries with 34 cases or 29.1%.

The most used means of evacuating the injured is transport by motorcycle in 72.65% (Table 3).

Table 2. Distribution of cases according to the circumstance of production of the lesions.

Circumstance	Frequency	Percentage
Fight with law enforcement officers	34	29.06
Attack by armed bandits	33	28.21
Disturbance of public order	14	11.97
Accidental ball	11	9.40
Militiaman Attack	15	12.82
Hunting Accident	5	4.27
Training	2	1.71
Confrontation	1	0.85
Patrol	2	1.71
Total	**117**	**100**

Table 3. Distribution of the injured according to their means of evacuation.

Means of evacuation	Frequency	Percentage
Motorcycle	85	72.65
Vehicle	9	7.69
Canoe then Motorcycle	20	17.09
Bike	2	1.71
Vehicle then Motorcycle	1	0.85
Total	**117**	**100**

3.2. Ballistic Aspects

According to this figure, the weapon that was used the most is the weapon of war, preferably the AK 47 in 76% of cases (Figure 7).

It appears from this table that war bullets were the most found in 76.07% of cases (Table 4).

Table 5 shows that 84 cases or 71.79% had lesions with entry and exit orifices without a retained projectile.

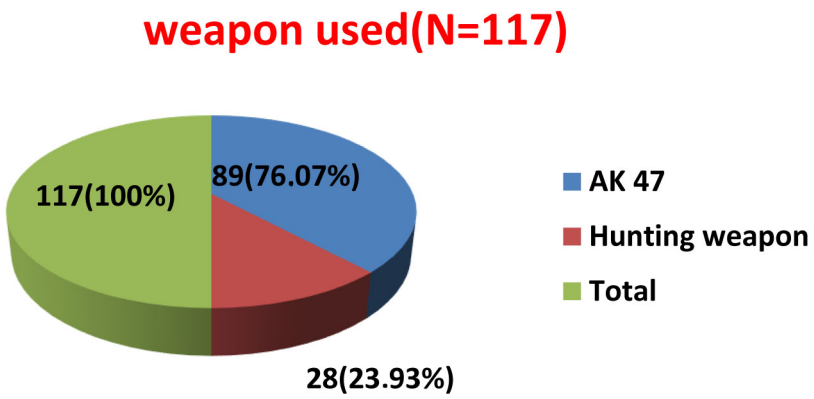

Figure 7. Distribution of cases according to the type of weapon used.

Table 4. Distribution of injured people according to the types of ammunition that caused these injuries.

Ammunition	Frequency	Percentage
War bullet	89	76.07%
Hunting lead	28	23.93%
Total	**117**	**100**

Table 5. Distribution of patients according to the presence of the projectile.

Incarcerated	Frequency	Percentage
Yes	33	28.21
No	84	71.79
Total	**117**	**100**

3.3. Clinical and Anatomopathological Aspects

The majority of injured people with 78 cases or 66.67% were hemodynamically stable (Table 6).

It appears from Table 7 that the left leg was the most affected segment with 56 cases or 47.86%.

Of all these firearm injuries, 68 cases or 58.12% concerned open fractures (Table 8).

The majority of soft tissue injuries are transfixing wounds with 27 cases or 56.25% (Table 9).

Table 10 shows that of the 68 cases of open fractures found, the two bones of the leg (Tibia and Fibula) were the most affected at the same time with 56 cases or 81.16%. The majority of fractures are complex, with a common trait in 69.57% of cases and fractures of the leg bones concerned more the proximal third with 38 cases or 55.07%.

The majority of these fractures, 31 cases or 44.93%, are type IIIB according to the G-A classification (Table 11).

It follows from Table 12 that in the majority of cases (52.14%), the leg lesions were isolated without association with any other lesion.

Table 6. Distribution of injured people according to hemodynamic state.

Hemodynamic	Frequency	Percentage
Stable(*)	78	66.67
Unstable(**)	34	29.06
In Extremis(***)	5	4.27
Total	**117**	**100**

(*): If the systolic pressure was greater than 100 mmHg. (**): If the systolic pressure was less than 100 mmHg. (***): If the pressure was not measurable but the patient showed signs of life.

Table 7. Distribution of injured according to leg affected.

Leg affected	Frequency	Percentage
Right Leg	45	38.46
Left Leg	56	47.86
Bilateral damage	16	13.68
Total	**117**	**100**

Table 8. Distribution of patients according to main lesions.

Injuries	Frequency	Percentage
Open fractures	68	58.12
Soft tissue wounds	28	23.93
Complete traumatic amputation	1	0.85
Total	**117**	**100**

Table 9. Distribution of injured people according to soft tissue damage (N = 48).

Soft tissue injury	Frequency	Percentage
Seton wound	5	10.42
Penetrating wound	14	29.17
Transfixing wound	27	56.25
Wound with nerve damage	2	4.17
Total	**48**	**100**

Table 10. Distribution of fractures according to the affected bone. the line and the site of the fracture (N = 69).

Type and site of fracture	Frequency	Percentage
Affected bone		
Tibia isolated	11	16.18
Isolated Fibula	2	2.94
Tibia and Fibula	56	81.16
Type of fracture		
Simple Fractures	21	30.88
Complex Fractures	48	69.57

Continued

Fracture site		
Proximal third	38	55.07
Middle third	21	30.88
Distal third	10	14.71
Total	**69**	**100**

Table 11. Distribution of Injured according to the Gustilo and Anderson classification (G-A).

Type of fracture according to G-A	Frequency	Percentage
Type I	6	8.82
Type II	15	22.06
Type III A	7	10.29
Type III B	31	44.93
Type III C	10	14.71
Total	**69**	**100**

Table 12. Distribution of injured people according to injury association.

Injury association	Frequency	Percentage
Abdomen	12	10.26
Spine	2	1.71
Thigh	16	13.68
Arm	11	9.40
Foot	1	0.85
Head	6	5.13
Chest	8	6.84
Without associated lesion	61	52.14
Total	**117**	**100**

4. Discussion

4.1. Epidemiological Aspects

4.1.1. Overall Frequency

From January 2019 to December 2023, we recorded 3572 admissions to the trauma department, among which 308 patients presented with ballistic trauma, representing a hospital frequency of 8.62% of cases and from these 308 trauma patients we took 117 cases of ballistic trauma. legs or 37.99%.

KIKOBYA found 28.3% in a study carried out in Bukavu under the same conditions of urban insecurity [19].

This significant frequency in civilian practice could be explained by the increase in insecurity in the city of Kisangani due to the large uncontrolled circulation of weapons held by armed groups in disarray coming from different battlefields in the province and the presence of armed militias in villages surrounding the city.

4.1.2. Age

The age group of 22 to 32 was the most common in 49.57% of cases.

The average age of our patients was 29.88 years with a standard deviation of

12.28 and extreme minimum 7 years and maximum 78 years.

The predominance of young subjects found in this series has been observed by other authors [21] [22]. It is linked to the youth of the populations in the canter's urban. The same is true of the male sex [22].

Gunshot wounds are becoming more and more frequent in most hospitals in the region due to the resurgence of regional conflicts, but especially the increase in juvenile delinquency in large African cities given the failure of policies to eradicate poverty in most countries in the sub-region [23] [24].

Our result is not as far from that of LASSINE who found the majority of the age group from 21 to 30 years old in 61% of cases [25].

This could be explained by the fact that man reaches the threshold of his physical strength and morality at this age and is more active in conflicts that may be armed. And young people of this age are more involved in urban banditry in Africa in general and in Kisangani in particular; without ignoring that the majority of the African population is young.

4.1.3. Sex

The male sex constitutes the majority of our injured in 76%, a sex ratio of 3/1 in favor of the male sex.

This male predominance could be explained by the fact that in us in society, men are more mobile and more active, therefore more exposed to firearm injuries, representing the able-bodied arms and combatant potential most often intervening on the battlefield, unlike women. But also men are more numerous in armed conflicts than women.

4.1.4. Occupation

All professional levels were affected but pupils and students were in the majority with 34 cases or 29.06%. That is a cumulative rate of 72.65% for civilians compared to 27.35% for soldiers and police officers. This result is lower than that of ZIDA with 92.5% of civilians and KONE with 93.8% of civilians [21] [26].

It is in the context of attacks by armed robbery that we have noted the main circumstances of leg injuries in many other series where the socio-economic realities are superimposable [24].

This predominance of civilians could be explained by the fact that on the one hand they are more numerous than men in uniform and on the other hand, by the fact that civilians form themselves into pressure groups confronting law enforcement officers to put forward their demands. But also inter-village conflicts over land disputes, those between breeders and farmers, increase violence among juveniles as noted in our series.

And the minority of soldiers and police officers can be explained by the protective measures taken by soldiers during armed conflicts, which are the wearing of helmets, bulletproof vests, etc.

4.1.5. Origin

The majority of patients came from the commune of Lubunga at 37% followed by

those from the commune of Makiso at 20%.

This is partly explained by the insecurity caused by clashes between armed tribal militias working around the urban-rural commune of Lubunga and that it is in the commune of Makiso where the large hospital establishments which receive the case referred.

4.1.6. Level of Study

It follows from this table that the majority of the injured were of secondary education in 45% of cases and only 7% were illiterate.

This could be explained by the fact that the majority of the injured came from an urban-rural municipality but where young people were beginning to easily access studies despite their low socio-economic level, thanks to free education.

4.1.7. Event Location

The majority of trauma victims with 53 cases or 45.30% had been injured on the street.

This could be explained by the fact that the majority of our sample was made up of pupils and students who usually take to the streets to demand improvements in their living conditions.

In addition, youth unemployment and their precarious living conditions push them to take to the streets to demand improvements in the streets, thereby exposing themselves to gunshot wounds.

4.1.8. Time between Event and Hospital Admission

The majority of our injured were admitted within 6 hours of the trauma, *i.e.* 73%.

This could be explained by the fact that the majority of our patients were victims in the city of Kisangani, then taken urgently to secondary or tertiary level hospitals located in the city allowing easy and rapid access to the injured.

4.1.9. Circumstance of Occurrence of the Trauma

The fight between law enforcement officers and the civilian population caused the greatest number of injuries with 34 cases or 29.1%.

Handling accidents generally occur among the security forces population during training sessions or other armed interventions [27].

This could be explained by the fact that the majority of these traumas occurred in the context of rights demands by a certain segment of the civilian population.

4.1.10. Means of Evacuating the Injured

The most used means of evacuating the injured is transport by motorcycle in 72.65%.

This could be explained by the fact that not only is the motorbike which is the transport most easily found within the reach of the local population but also it is the most adapted to the almost non-existent road infrastructure in our study area.

4.2. Ballistic Aspects

4.2.1. Type of Weapon Used

The weapon that was used the most is the weapon of war, preferably the AK 47 in 76% of cases.

According to SPRAGUE, its very low cost, its robustness, its reliability and its great ease of maintenance make it extremely popular, in particular with guerrillas and countries with few financial means to equip their infantry. This is the reason why guerrillas and other members of revolutionary armed groups are equipped with them during their missions (desert, forest and other hostile places) [28].

Being in a country torn by war for decades and in a province surrounded by armed militias, weapons of war circulate without control or regulation. Unfortunately, the AK47 is the easiest to find and obtain and is the most widely worn by law enforcement officers.

4.2.2. Type of Ammunition (Projectile) Found

It emerges from this analysis that it was war bullets which caused more leg injuries in 76.07%. Our result is lower than that of KONE which found 93.75% [26].

This result would be justified by the illegal and uncontrolled detention of weapons of war in the city of Kisangani.

And by the fact that our study environment is part of the red zone which for more than three decades has been ravaged by endless armed conflicts opposing several foreign armed forces with the consequence of an increased and uncontrolled circulation of weapons of war.

4.2.3. Retained Projectile

In our study, 84 cases or 71.79% had lesions with entry and exit orifices without a retained projectile and 33 cases or 28.21% had lesions with a single entry orifice with a retained projectile.

According to BRUNER, chronic retention of a projectile within the joint is likely to cause severe arthritis or lead poisoning and must therefore be removed early [29] [30].

This could be explained by the fact that the majority of injuries were caused by weapons of war, which are high-velocity weapons used in civilian practice in urban environments at short firing distances.

4.3. Clinical and Anatomopathological Aspects

4.3.1. Hemodynamic Status of the Injured

The majority of injured people with 78 cases or 66.67% were hemodynamically stable.

This would be due to the fact that all the injuries occurred in an urban environment where the transportation of the injured was early and easy, thus facilitating their treatment before various hemodynamic disturbances.

4.3.2. Affected Leg

The left leg was the most affected segment with 56 cases or 47.86%. This would be

a coincidence because all legs can be affected in the same way without predilection or preference.

4.3.3. Main Lesions

Of all these firearm injuries, 68 cases or 58.12% concerned the bones (open fractures). ZIDA in its study found 75.30% of simple wounds without fracture [21].

On the other hand, according to CLASPER, civilian ballistic fractures are often considered low-velocity trauma, but the transfer of energy during the deformation of the projectile within the body can be intense [31].

This would be due to the nature of the projectiles, which in our study are mainly warlike with high energy used in urban environments and therefore at point blank range.

4.3.4. Isolated Soft Tissue Lesions

The majority of soft tissue injuries are transfixing wounds with 27 cases or 56.25%. This could be explained by the fact that the shots were received at short distance with high kinetic energy weapons during exchanges with law enforcement officers and armed bandits in the context of urban banditry.

4.3.5. Bone Affected in the Leg

Of the 68 cases of fractures found, the two bones of the leg (Tibia and Fibula) were the most affected at the same time with 56 cases or 81.16%. This implies that the main goal of the shooters in this study was to immobilize their targets. And on an anatomical level, bones are less protected because they are less covered by soft parts.

4.3.6. Type of Fracture Line

The majority of fractures are complex that is to say with a common trait in 69.57% of cases. This could be explained by the fact that the two bones of the leg are directly subcutaneous, in an anatomical region with few muscular masses and therefore exposed to impact during trauma with high kinetic energy caused by war bullets which are also the most frequently found in our study.

4.3.7. Draft Seat

Fractures of the leg bones concerned more the proximal third with 38 cases or 55.07%. This could be explained by the fact that the upper third of the leg is larger than the rest and therefore more exposed and easier to aim by the shooter.

4.3.8. Fracture Classification According to Gustilo and Anderson

The majority of these fractures, 31 cases or 44.93% are type IIIB according to the Gustilo and Anderson classification. This observation would be linked to the fact that these lesions are produced in an anatomical region where the bones are directly under the skin and therefore poor in muscle masses capable of absorbing the shock.

4.3.9. Associated Lesions

The majority of cases (52.14%) of leg lesions were isolated without association

with any other lesion.

In gunshot trauma, limb wounds appear at first glance to be the least serious, and have a generally high survival rate.

However, they should not be neglected because they are generally associated with vascular-nervous bone lesions which can greatly alter the patient's vital and functional prognosis [32].

This would be due to the fact that in our study the most frequently found projectiles are those of war (jacketed) which do not have this fragmentation property, which means that the latter only reach the parts targeted by the shooters.

5. Conclusions

Leg injuries from gunshots are therefore common (37.99%) in a civilian environment like ours, and should therefore allow hospital practitioners to gain extensive experience in their treatment. This retrospective study, associated with a review of the literature, has the advantage of offering an overview of what the management of a ballistic leg wound should be in a civilian hospital.

Due to the proliferation of firearms, particularly in the eastern region of the DRC, firearm injuries are significantly increasing.

The care of these injured people, although it has become routine in certain hospital settings, suffers from shortcomings regarding the rational and scientific approach of the medical staff caring for them.

Leg injuries caused by weapons therefore continue to pose serious treatment problems due to ignorance of the concepts of injury ballistics by the civilian medical profession, especially in our environment ravaged by armed conflicts of all kinds.

Author Contribution

Each author contributed to the writing of the manuscript (literature review, protocol development, data collection and analysis, writing, reading the final version).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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