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Profile and factors associated with mortality in orthopaedics and traumatology at Saint Jean de Dieu Hospital in Afagnan, Togo

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Abstract
Introduction: Knowledge of mortality statistics is important in the fight against the major causes of death. It is an indicator of the quality of care in a hospital. The main objective of this study was to identify the profile of deceased patients and the factors associated with mortality.
Patients and methods: This was a retrospective, descriptive and analytical study. It focused on patients over the age of 15 who died during hospitalisation, either during or after surgery. The study period ran from [1]January 2012 to 31 December 2021. The parameters studied were socio-demographic, therapeutic and prognostic data. Statistical analysis was performed using the Chi-square test. The factors studied were: age, comorbidities, Baker's Injury Severity Score (ISS), the American Society of Anesthesiologists (ASA) score, and the cause of death.
Results: Of the 4,253 records collected, 180 deaths were recorded, representing 4.2%. The median age was 52.6±19.5 years (16-98). There were 69 (57.5%) men and 51 (42.5%) women. Delayed consultation affected 42.5% of patients. The main reason for consultation was diabetic gangrene in 49.2% of cases. Amputation was the most common procedure performed, at 75.8%. The main causes of death were septic shock and anaemia. The risk factors identified were: severe ISS score, male gender, time of death, septic shock and anaemia.
Conclusion: Hospital mortality due to trauma is a public health problem in our country. The mortality rate was 4.2%. The risk factors identified were male gender, ISS score (>25), time of death (at night), septic shock and anaemia.

Keywords: Epidemiology, associated factors, mortality, orthopaedics, traumatology

Introduction
Knowledge of mortality statistics is important in the fight against the major causes of death. Trauma is one such cause and represents a major challenge in traumatology. Traffic accidents will cause 13 million deaths and 500 million additional injuries and will hinder sustainable development, particularly in low- and middle-income countries[1]. This problem is a major public health issue and represents a real challenge for the organisation of healthcare systems, particularly in low- and middle-income countries where death rates are generally higher than in so-called high-income countries[2]. Some authors have reported an increase in hospital mortality in trauma care, from 0.6% in 2001 to 2.9% in 2005 [3-4]. Yao L *et al*. found hospital mortality to be 3% in 2021 [8]. In Togo in 2023 [5] according to the report by the Ministry of Security and Civil Protection, there were 282 deaths out of 4,611 injuries and 3,262 accidents recorded, i.e. 8.64%. This excess mortality due to trauma accounted for 44% after hospitalisation [6] and is thought to be linked to several risk factors. Identifying these factors will help to identify possible solutions to reduce this mortality rate. The aim of this study was to identify the profile of deceased patients and the factors associated with mortality in the orthopaedic and trauma surgery department of the Saint Jean de Dieu Hospital in Afagnan, Togo.

Materials and methods
This was a retrospective, descriptive cross-sectional study. It was conducted over a 10-year period, from 1 January 2012 to 31 December 2021, in the orthopaedic and trauma surgery department of the Saint Jean de Dieu Hospital in Afagnan, Togo. The study included all

complete records of patients over the age of 15 who died from traumatic injuries while hospitalised, during surgery in the operating theatre or in intensive care during the study period. Incomplete records were not included in our study. Deaths recorded upon admission to the emergency department and complete records of patients who died outside the study period were excluded. The variables studied were: socio-demographic data, mode of admission (primary or secondary), circumstances and mechanisms of the accident, time between the accident and arrival at the hospital, Baker's Injury Severity Score (ISS) (Table 1) [7].

Table 1: Injury Severity Score

Region	AIS	Damage	ISS
Head and Neck	1	Minor	1-8
Face	2	Moderate	9-15
Thorax	3	Serious	16-24
Abdomen, Pelvis	4	Severe	25
Limbs, Pelvis	5	Critical	50-74
Skin, Tissue,Subcutaneous	6	Maximum	75 Maximum

*** AIS:** Abbreviated Injury Scale

The following were also studied: type of resuscitation on admission, ASA[8] (American Society of Anesthesiologists) score of patients undergoing surgery, type of anaesthesia, type of treatment, average treatment time, length of hospital stay and : time to treatment, causes of death. The data were entered using Epi Info 2008 3.5.1 software. The Chi-square test with a significance threshold of 5% (P< 0.05) was used to compare proportions.

Results

Epidemiological data

During the study period, 4,253 patients were hospitalised. One hundred and eighty deaths were recorded during this period. One hundred and twenty files of deceased patients were retained, representing a mortality rate of 2.8% (Fig. 1). Sixty files were not included.

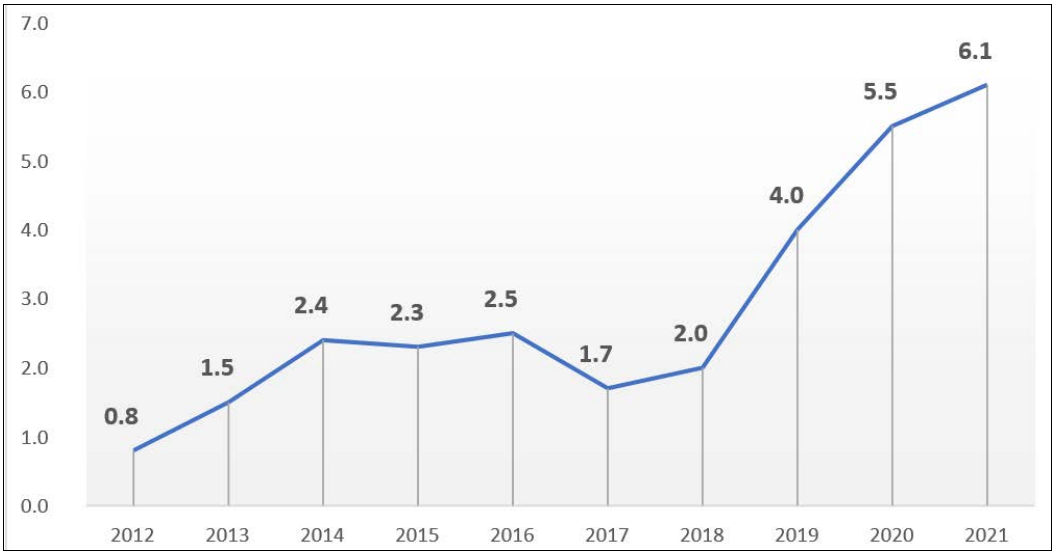

Fig 1: Distribution of mortality rates by year

The average age of deceased patients was 52.6±19.5 years [16-98]. There were 69 men (57.5%) and 51 women (42.5%) with a sex ratio of 1.4. The reason for hospitalisation was multimodal (Table 2).

Table 2: Distribution of deceased patients according to diagnosis on admission

Condition Category	n	Percentage (%)
Traumatic conditions		
Recent trauma	57	47.5
Multiple trauma	27	22.5
Limb fractures	25	20.8
Femoral neck fractures	10	8.3
Leg fractures	8	6.7
Femur fractures	7	5.8
Pelvic limb crush injuries	3	2.5
Transcotyloid dislocations	2	1.7
Post-traumatic complications		
Gas gangrene	31	25.8
Dry gangrene	28	23.4
Bone tumours	4	3.3

The severity of multiple trauma was assessed using the Injury Severity Score (Table 3). Twenty-three deaths (40.35%) were preventable (minor, moderate and severe trauma not lifethreatening) and 34 deaths (59.65%) were not preventable (severe trauma with risk to life and severe trauma with uncertain survival).

Table 3: Distribution of polytrauma patients who died according to ISS score

	n = 57	Percentage
Minor	2	3.5
Moderate	5	8.8
Severe but not lifethreatening	16	28.1
Severe with risk to life	24	42.1
Severe with life-threatening risk	10	17.5

Causes of death

Septic shock was responsible for the deaths of 92 patients, or 76.7%. (Table 4)

Table 4: Distribution of deceased patients according to cause of death

	n =120	Percentage
Septic shock	92	76.7
Anaemia	20	16.7
Pulmonary embolism	4	3.2
Hypoglycaemia	2	1.7
Crush syndrome	2	1.7

Characteristics of death

The characteristics of death are reported in Table 5. Deaths occurred within the first six hours in 66.7% of cases and in the majority of cases during hospitalisation in 90% of cases (Table 5).

Table 5: Distribution of deceased patients according to characteristics of death

Category	Sub-category	n	Percentage (%)
Time to death (days)	≤ 1	33	27.5
	3-5	41	34.2
	6-10	14	11.7
	11-15	11	9.2
	16-20	7	5.8
	21-25	9	7.5
	26-30	5	4.2
Time of death (hours)	00-06	80	66.7
	07-13	12	10.0
	14-20	28	23.3
Place of death	Hospitalisation	108	90.0
	Resuscitation	7	5.8
	Operating theatre	5	4.2
Surgical period	Pre-operative	13	10.8
	Intraoperative	5	4.2
	Postoperative	102	85.0

Associated factors

The analysis of factors associated with the occurrence of deaths is reported in Table 6.

Table 6: Analysis of factors associated with the occurrence of deaths

Category	Sub-category	n	Percentage (%)
Time to death (days)	≤ 1	33	27.5
	3-5	41	34.2
	6-10	14	11.7
	11-15	11	9.2
	16-20	7	5.8
	21-25	9	7.5
	26-30	5	4.2
Time of death (hours)	00-06	80	66.7
	07-13	12	10.0
	14-20	28	23.3
Place of death	Hospitalisation	108	90.0
	Resuscitation	7	5.8
	Operating theatre	5	4.2
Surgical period	Pre-operative	13	10.8
	Intraoperative	5	4.2
	Postoperative	102	85.0

*Fall, Fight, Work accident, Firearm, Tumour

Table 7: (Continued): Analysis of factors associated with the occurrence of deaths

Variable	Unavoidable	Preventable	RR and CI	P value
Abdominal trauma				
Yes	7	2	1.09 [0.63–1.87]	0.283
No	66	45	1	—
Chest trauma				
Yes	4	3	1.15 [0.59–2.46]	0.207
No	69	44	—	—
Trauma of limbs				
Yes	18	7	1.64 [0.36–1.10]	0.080
No	55	40	—	—
Lesional association				
Yes	25	13	1.07 [0.74–1.54]	0.187
No	48	34	—	—

RR: relative risk; CI: confidence interval

Discussion

Hospital statistics

During this study, the department recorded 4,253 hospitalisations with 180 deaths, representing a hospital mortality rate of 4.2%. This result could be explained, on the one hand, by delays in treatment due to a lack of financial resources and the absence of health coverage enabling patients to receive care without having to pay for it in advance. On the other hand, it could be explained by structural problems: the lack of appropriate technical facilities, and the obsolescence and/or inadequacy of hospital infrastructure. However, our results are close to those of

Serge Bitha's series (4.38%) [9]. On the other hand, they differ from those of Yao L.B. *et al* [10] and in Ivory Coast (3%) and Diemer *et al* [7] who reported mortality rates of 3% and 8% respectively. This could be explained by the fact that hospital mortality varies according to the type of patients admitted to a department, whether the surgery is urgent or not, and the age and condition of the patients, which allows them to be classified according to ASA score [12, 13].

Socio-demographic data

The profile of the deceased was a man in his sixties, a farmer, which explains the delay in treatment, as he sought medical advice late due to a lack of financial resources and after exhausting traditional treatments and self-medication. The predominance of men observed in this study has also been highlighted by several authors [14, 15-17]. This result could be related to the high number of male patients in the study sample. Thus, for a given study, the results observed could be related to the size and type of sample and the type of pathology treated [12, 17]. Housewives and farmers were the most affected, as the study was conducted in a rural setting with a predominance of diabetic gangrene of the lower limbs at admission. These are the social strata of the population that most often travel on foot. They work in the fields without protection, which sometimes causes skin lesions that go unnoticed and can be fatal. Uncontrolled diabetes mellitus is considered a factor in severity and mortality [18, 19]. The mortality observed among diabetics in this study corroborates that reported in the literature [18-20]. This is probably due to late treatment of the condition or patients' non-compliance with diabetes treatment. However, the deaths were not directly attributed to comorbidities.

Clinical aspects of deceased patients

From a clinical point of view, the delay in receiving treatment was excessively long (6.5 hours on average), as only 10.3% of cases received pre-hospital care by medical transport. This can be explained by the lack of adequate pre-hospital emergency and care facilities such as SAMU (Emergency Medical Assistance Service) and SMUR (Mobile Emergency and Resuscitation Unit) for the injured. These tools are essential in the pre-hospital management of accident victims. They provide medical care. initially at the scene of the accident and during transport. These results are consistent with those found in the literature [21-22]. Traumatic pathology 116 (96.7%) dominated this series and was due to traffic accidents 98; 84.5%. Careless driving and the poor condition of our roads are the most common contributing factors in our context. The prevalence of this pathology in our context is similar to the results found by Obame R *et al* [16] and Diemer *et al*. [11] Deaths due to multiple injuries accounted for 32.8%. The head (25.9%), abdomen (33.3%), thorax (25.9%) and spine (14.8%) were the most frequently injured anatomical regions. The limbs accounted for 20.8%. Diabetic gangrene 59; 49.2% was predominant, which can be explained by the low socio-economic status of the population, resulting in delays in consultation and treatment. Similarly, patients' ignorance meant that they only came to hospital after exhausting other therapeutic resources (traditional treatment and self-medication) [23]. In order to assess the severity of the injuries, Bakar's Injury Severity Score (ISS) [7] was calculated for each injured person. The ISS is specific to polytrauma patients. Despite its wide variability in the literature consulted, it is often high, reflecting the multiplicity and severity of injuries in polytrauma patients. Thus, 59.3% had severe, life-threatening trauma and 40.7% had severe, non-life-threatening trauma.

Therapeutic aspects

Patients were seen on admission at the stage of complications (coma, shock and/or hypoxia) in the majority of cases (51, or 42.5%). Amputation was performed in 91 (75.8%) cases, reflecting delays in consultation and treatment, which clearly influence mortality. This opinion is shared by Harouna *et al*. [24]. In addition, 30% of patients were received by paramedics upon admission. It is likely that this situation may have led to inappropriate treatment in our series: insufficient resuscitation care, undiagnosed injuries andSurgical indications not made in time due to the limited number of trained personnel and the lack of a multidisciplinary team approach. In addition to this, the existence of technical facilities that were completely unsuitable for the treatment of seriously injured patients (no CT scanner), the absence of anaesthetists and intensive care specialists, and the lack of intensive care facilities characterised our team and could explain this result. These problems are common to several low-income countries and have already been mentioned by other authors [2].

Characteristic aspects of deaths

In this series, 180 deaths were recorded, representing a mortality rate of 4.2%. Regarding the time to death in our study: 27.5% of deaths occurred within 24 hours; 34.2% between the 2nd and 7th day, highlighting the determining factors of death in hospital settings, which are insufficient technical facilities for resuscitation and, above all, a shortage of qualified personnel. This result is reported by Cheikh [25] who found that 30% of deaths occurred within the first 12 hours after admission. Deaths most often occurred at night (between midnight and 6 a.m.) in 66.7% of cases. This period corresponds to the hours when professional activities are at their lowest and when those accompanying patients often sleep, leading to a decrease in clinical monitoring of patients [11, 26, 27]. In most cases, these deaths occurred during post-operative hospitalisation. Yao L.B. *et al* [10] and Diemer *et al*.[11] made the same observation in their studies. Septic shock was the main cause of death in this study, given that the predominant reason for admission was diabetic gangrene. Sepsis appears to be caused by delays in treatment and late consultations by patients at health centres [28, 29]. Similarly, the lack of technical facilities, especially for resuscitation, would explain the High mortality rate in cases of septic shock in resource-limited centres [11].

Prognostic factors

The main prognostic factors that emerged were: age ≥ 60 years, type of pre-hospital care, time to treatment and staff qualifications, pulse oxygen saturation below 90%, and a Glasgow score below 8. Advanced age appears to be a negative prognostic factor due to the high frequency of comorbidities in elderly people [30]. Medical transport such as SAMU or SMRU was inadequate; these tools are essential in the pre-hospital management of accident victims. They provide initial medical care at the scene of the accident and during transport. The delay in treatment was linked to low socio-economic status.

Staff qualifications were an issue and linked to staff shortages due to a lack of recruitment. Similarly, the crucial role of hypoxia in the prognosis of severely traumatised patients has already been highlighted in several studies [31, 32]. As for the Glasgow Coma Scale (GCS), several studies have confirmed its validity in categorising severely injured patients according to prognostic risk [33, 34] . According to studies, the management of a severely injured patient with a Glasgow

Coma Scale score < 8 is associated with a mortality rate ranging from 30 to 50%, or even 90% if unresponsive mydriasis is observed [35, 36]. With regard to the ISS score, mortality was linked to the ISS score (>25) in this study when it concerned patients with multiple trauma. There was a statistical link between male gender, severe ISS score (>25), time of death (at night), septic shock, anaemia and death.

Conclusion

Identifying mortality factors makes it possible to define prevention strategies and establish patient care protocols. The causes are multimodal. The associated factors observed were gender, ISS score, type of pre-hospital care, time to treatment, and staff qualifications. The hospital mortality rate was 4.2%. This mortality mainly affected males aged between 60 and 69. Road traffic accidents were the most common cause in 83% of cases, with an ISS of 59.65%, reflecting the severity of the injuries. Pre-hospital care was provided in only 10.3% of cases. Therefore, the structural organisation that we lack must strive to make certain measures available to the population. More elaborate prospective cohort studies on the survival of severely traumatised patients should be considered in order to better identify the predictive factors of mortality.

Conflict of interest: None

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