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Research Article

Prognostic factors of polytrauma patients in intensive care of the National University Hospital Hubert Koutoukou MAGA (CNHU/HKM) in Cotonou

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ABSTRACT

Introduction: Polytrauma accounts for a public health problem due to its frequency, major disabilities and the mortality it causes. 30% of deaths linked to polytrauma are preventable when the treatment is adequate.

Objectives: To determine the factors favoring the mortality of polytrauma victims admitted to intensive care at the CNHU/HKM during the period from January 1, 2013 to July 31, 2017.

Materials and methods: It was a cross-sectional, descriptive and analytical study with retrospective data collection. It was conducted in the resuscitation department of the CNHU/HKM of Cotonou, from January 1, 2013 to July 31, 2017. All the cases of polytrauma hospitalized in resuscitation during the study period and whose records were complete, were included.

We had studied: the frequency of polytrauma victims, the socio-demographic, clinical and paraclinical, therapeutic and progressive data, then the prognostic factors of the patients.

Epi-info 7.1.5.0 software was used for analysis and data entry.

Statistical analyses were performed using the Pearson chi^2 test with a significance threshold for a p value ≤ 0.05. The confidence interval was set at 95%.

Results: The frequency of polytrauma victims was 1.6%. The polytrauma patients were predominantly young male adult, on average 33.9 years old (sex ratio of 5.8), victim of a road traffic accident in 89.4% of the cases, associated with a TCE in 89.6% of the cases.

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Conclusion: Polytrauma is less common in intensive care, but burdened with heavy morbidity and mortality. The modifiable factors responsible for preventable deaths in polytrauma patients are: Dysfunction of the pre-hospital health system, lack of organization in the management of polytrauma victims, limited technical platform and personnel, and a poor training of health workers.

Keywords: Polytrauma, Factors associated with death, Mortality

INTRODUCTION

Polytrauma accounts for a public health problem due to its frequency, major disabilities and the mortality it causes. The polytrauma patient is a seriously injured person, who presents a combination of several lesions, at least one of which is life-threatening in the short and medium term (Garric, 2013; Benmiloud, 2000; Lenfant, 1998).

Polytrauma is a public health problem, much more studied in road traffic trauma. It is the world leading cause of death in young people aged 15-24 (Murray and Lopez, 1997). In developed countries such as France and Canada, it is the 1st cause of death in the 40-year-old age group, and in the United States, it is the 3rd cause of death (Krug, 2000). It is a source of major acquired disabilities. And apart from cranioencephalic trauma, the resumption of professional activity requires on average 2 years of rehabilitation with significant socioeconomic costs (Anaes, 2004).

In Africa, by reason of limited technical and financial resources, mortality linked to polytrauma can reach 60% (Brouh, 2007). It is reported in developed countries that when the management is adequate, 30% of deaths linked to polytrauma are preventable (Cayten, 1991).

The aim of our work is to determine the factors favoring the mortality of polytrauma patients in intensive care of the CNHU/HKM.

GOALS

To determine the frequency and epidemiological profile of polytraumatized victims, to identify the prognostic factors of polytrauma patients in the intensive care unit of the CNHU/HKM and to propose solutions to reduce mortality linked to polytrauma at CNHU/HKM.

MATERIALS AND METHODS

It was a cross-sectional, descriptive and analytical study with retrospective data collection. It took place in the multipurpose anesthesia and resuscitation department of the CNHU/HKM of Cotonou, from January 1, 2013 to July 31, 2017. The study population consisted of all polytrauma cases hospitalized in the intensive care unit during the study period. The polytrauma patient is defined as a trauma patient with several lesions, at least one of which is life-threatening. The exclusion criteria were cases of polytrauma hospitalized in the intensive care unit during the study period and whose medical records were unusable. The variables studied were: Prevalence; progressive, paraclinical, clinical and socio-demographic data; prognostic factors and mortality. The data were collected using a data sheet developed for this purpose, from the resuscitation register and patients records. The analysis and data entry were carried out using Epi-info software version 7.1.5.0. The graphs were produced using Excel 2013 software. Statistical analyses were performed using the Pearson chi^2 test with a significance threshold for a p value ≤ 0.05. The confidence interval was set at 95%.

RESULTS

Frequency

A total of fifty-four (54) polytrauma cases were collected out of 3465 hospitalized patients in intensive care during the study period, which corresponds to a frequency of 1.6%.

Forty-eight (48) polytrauma cases were studied after the exclusion of six (06) files.

Sociodemographic data of polytrauma victims

The average age of polytrauma victims was 33.9 years with the extremes of 5 and 68 years. Young people aged 20 to 40 represented 50% of the sample and were the most representative.

The patients were male in 41 cases (85.4%); sex ratio was 5.8

Clinical data

Mechanism of polytrauma: Polytrauma was caused by road accidents (RA) in 42 patients (89.4%); the other mechanisms are due to industrial accidents and falls (2.43% each), and 01 cases of assault (2.1%). The following Table 1 represents the different circumstances of the RA.

Table 1. Circumstances of RA in polytrauma patients hospitalized in intensive care (2013-2017)

RA circumstances	Size	Percentage (%)
Car-to-car	3	7.1
Motorbike-to-motorbike	5	11.9
Motorbike-to-car	12	28.6
Car-to-pedestrian	5	11.9
Motorbike-pedestrian	6	14.3
Motorbike-obstacle	6	14.3
Not specified	5	11.9
Total	42	100

Mode of transport and admission to intensive care: The mode of transport was the non-medical ambulance in 11 patients (23%), the fire brigade in 12 patients (25%), and the personal means of transport in 25 patients (52%). The admission time between the accident and resuscitation is shown in Figure 1.

This time-limit was less than 24 hours in 25 patients (59.5%), after 24 hours in 17 patients (40.5%). The timeframe was not specified in 06 patients.

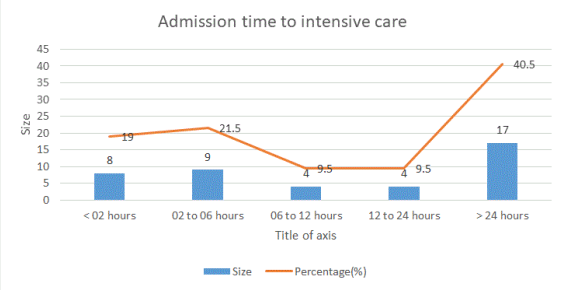

Figure 1. Admission time to intensive care for polytrauma victims (2013-2017)

Major associated lesions in polytrauma victims (Tables 2 and 3).

Table 2. Distribution of patients according to major lesions associated with polytrauma

Major lesions	Size	Percentage (%)
CFET	43	89,6
Limb trauma	38	79,2
Torax trauma	11	22,9
Abdomen trauma	8	16,7
Rachis trauma	8	16,7
Pelvis trauma	3	6,3
CFET: Craniofacial And Encephalic Trauma		

Impairment of neurological function

State of consciousness: Forty patients (85.1%) presented with disturbances of consciousness, of whom 27 (67.5%) with a GCS ≤ 8.05 (12.5%) with a GCS between [9-12], and 8 (20%) presented a GCS between [13-15]. Two (02) cases of convulsive disease, 4.17%, were found among polytrauma victims.

State of pupils: Pupillary anomalies were found in 11 of our patients. These were 4 cases of reactive bilateral mydriasis (8.3%) and 7 cases of anisocoria (14.6%).

Pyramidal syndrome: Left hemiplegia was found in 03 of our patients (6.25%) and right hemiplegia in one trauma patient. Medullary involvement with tetraplegia type is identified in 4 polytrauma patients (8.33%).

Cardiovascular impairment: Sixteen polytrauma patients from our series (33.3%) presented a hypovolemic shock which required filling and transfusion of labile blood products. Of these, 8 (50%) required the addition of vasoactive drugs. Five cases of cardiopulmonary arrest (31.25%) were noted among polytrauma victims in shock.

Respiratory impairment: Achievement of respiratory function with respiratory failure requiring oxygen therapy was noted in 44 of our patients (91.7%). Among them, 32 patients (72.7%) presented respiratory distress requiring an orotracheal intubation with ventilatory assistance.

Paraclinical data: We focused on the CT, radiographic and ultrasound results. A total of 48 CT examinations were performed, including 34 cerebral (82.9%), 6 thoracic (14.6%), 6 spinal (14.6%) and 2 abdominal (4.9%). The fast ultrasound was performed in 06 patients including 05 abdominal (12.2%) and one scrotal. 31 polytrauma victims underwent the standard thorax radiography (75.6%), the spine in 33 patients (80.5%), the pelvis in 32 patients (78%) and the limbs in 35 patients (83.3%).

Table 3. Summarizes the organic lesions found in our patients

Organic lesions	Size	Percentage (%)
Brain-meningeal lesions	36	75
Brain contusions	8	22,22
intraparenchymal hematoma	7	19,44
Diffuse axonal lesions	7	19,44
subdural hematoma	4	11,11
Cerebral edema	4	11,11
Subarachnoid hemorrhages	3	8,33
Sub arachnoid hematoma	2	5,55
Extradural hematoma	1	2,8
Pleuropulmonary lesions	18	37,5
Haemothorax	7	38,88
Pneumothorax	6	33,33
Lung contusion	4	22,22
Bronchial lesions	1	5,55
Visceral lesions	11	22,92
Splenic lesions	3	27,27
Intestinal perforations	3	27,27
Diaphragmatic ruptures	2	18,18
Gastric perforation	1	9,09
Mesenteric wound	1	9,09
Rectal wound	1	9,09

Therapeutic data

Non-medical treatment: Oxygen therapy was required in 44 patients (91.7%). Thirty-two of them (72.7%) were ventilated and put on ventilators.

Medical treatment: Noradrenaline was used in 50% of the 16 cases of shock. Labile blood products were administered to 20 patients (41.66%). All 20 patients received red blood cell concentrate (RBC). The amount of RBC received by each patient has not been specified. Fresh frozen plasma

(FFP) was administered to 8 of the 20 transfused patients, i.e. 40%; the number of FFPs administered to each patient was not recorded in the file.

Neurosedation was required in 27 patients (56.2%). It consisted of the administration of the Fentanyl and diazepam combination in agitated patients and those who received ventilatory assistance. 20% or 10% mannitol osmotherapy was administered to 06 patients (12.5%).

Surgical treatment: It consisted in the surgical management of lesions in our polytrauma patients. Table 4 provides an overview of treatment for polytrauma patients.

Table 4. Treatment of polytrauma patients in the intensive care unit of the CNHU/HKM (2013-2017)

Treatment	Size (n=48)	Percentage (%)
Ventilation assistance	32	66,66%
Norepinephrin	8	16,66
Transfusion		
RBC alone	12	25
RBC/FFP	8	16,66
Neurosedation	27	56,25
osmotherapy	6	12,5
chest drain	5	10,41
tracheotomy	1	2,08
Surgical intervention		
Trauma	25	52,08
Laparotomy	8	16,66
ORL	5	10,41
Neurosurgery	2	4,16
Urologic	1	2,08
RBC: Red Blood Cell Concentrate; FFP: Fresh Frozen Plasma		

The course was simple in 15 patients (31.25%). Two patients returned directly to the house. The remaining 13 were transferred to other departments.

Twenty-one patients (43.7%) had developed complications during their stay. Complications are summarized in Table 5.

Table 5. Complications in polytrauma patients in the CNHU/HKM intensive care unit

Complications	Number	Frequency
Nosocomial infections	15	71,4
PAMV	4	19
Bedsores	3	14,3
Metabolic disorders	3	14,3
Decompensated anemia	2	9,5
PAMV: Pneumonitis Acquired Under Mechanical Ventilation		

Mortality

The evolution was marked by death in 22 patients corresponding to an overall mortality of 45.8%. The circumstances of death were: HTIC with engagement in 15 patients (68.2%), nosocomial infections with septic shock in 4 patients (18.2%), hypovolemic shock with multi visceral failure in 4 patients (18.2%) and anemic decompensation in 1 patient.

Duration of resuscitation stay: It was on average 9.8 days with extremes of 1 and 65 days.

Prognostic factors: There was a significant association found between (the state of consciousness assessed by the GCS, the state of the pupils, the need for ventilatory assistance or not, the need for vasoactive drugs or not, the need for neurosedation or not, length of stay in intensive care) and death. The polytrauma patient is more likely to die when he has a GCS ≤ 8, he has been put on ventilatory assistance, he has benefited from neurosedation or vasoactive drug, he has bilateral anisocoria or mydriasis, and he stays longer in intensive care. Table 6 summarizes the different prognostic factors found in our polytrauma victims.

Table 6. Prognostic factors in polytrauma patients hospitalized in intensive care (2013-2017)

	Survivors	Non-survivors	p-value
GCS			
≤ 8	10	17	
Between 9-12	3	2	0,02
Between 13-15	12	3	
Pupil state			
Myosis	4	4	
Normal	19	9	0,03
Bilateral mydriasis	0	4	
Anisocoria	2	5	
IOT+ventilatory assistance			
Yes	12	19	0,009
No	13	3	
Vaso-active drug			
Yes	1	7	0,01
No	24	15	
Neurosedation			
Yes	12	18	
No	13	4	0,01
Length of stay			
≤ 24 Hours	1	9	
Between 2-10 days	16	11	
Between 11-30 days	7	0	0,03
Between 31-65 days	2	2	

DISCUSSION

Frequency

Our study focused on polytrauma patients admitted to intensive care during the period from January 1, 2013 to July 31, 2017 i.e. 55 months. Fifty-four polytrauma cases had been collected, corresponding to a frequency of 1.6% compared to admissions to intensive care. This frequency is much lower than those found in African studies. Tounkara et al in Mali, Tchaou et al in Parakou, Sima et al in Gabon had reported frequencies varying between 4% and 34.8% (Tounkara, 1990; Tchaou, 2012; Sima, 1998). In surgical resuscitation in developed countries, the frequency of polytrauma victims is significantly higher and can approach 50% (Miller, 1978). This low frequency of polytrauma patients in our series is due to the fact that the intensive care unit of the emergency department hospitalizes and treats a good part of these polytrauma victims.

Epidemiological profile of polytrauma patients in intensive care at the CNHU/HKM

The profile of the polytrauma patient in our study was that of a young adult of 33.9 years of mean age, most often

male (sex ratio of 5.8), who was the victim of a road accident in 89.4% of the cases, and presented an associated cranioencephalic trauma in 89.6% of the cases. Similar results have been found by several authors both in Sub-Saharan Africa and in developed countries. Tchaou et al. 2012 and Tchégnonsi et al. 2008 in Benin reported an average age of 32.2 years and 28.5 years, with a predominance of the male sex. Najall Pouth et al. 2013 in Cameroon, Brouh et al. 2007 in Ivory Coast, Tounkara, 1990 in Mali or Khay, 2013 in Morocco had the same polytrauma profiles as us. Sow, 2003 in Mali and Sima et al. 1998 in Gabon, revealed a predominance of TCE in polytrauma victims with respective rates of 60% and 45.5%. This polytrauma profile can be explained by the fact that it is the young male population that is the most active, driving motorbikes and not wearing continuously helmets.

Morbidity and Mortality

Polytrauma is a public health problem not only by its frequency, but especially by the heavy morbidity and mortality that it generates (Garric, 2013; Sauaia, 1995). It is a source of major disabilities acquired with significant socio-economic costs (MacKenzie, 2006). The mortality rate in our research was 45.8%. Even if this rate has improved compared to that reported by Tchégnonsi, 2008 at CNHU/HKM, it still remains high since we lose nearly one in two polytrauma victims. Najall Pouth et al. 2013, found the same death rate as us 46%, and Brouh et al. 2007 reported a higher rate 58.5%. These two authors linked their mortality rates to the failure of the pre-hospital system, the long delay in treatment and the severity of clinical lesions. The pre-hospital and management system is needed to improve for decreasing of hospital mortality rate lower to 2% as had proved in France Lapostolle et al. 2004 and Caillot et al. 2016 but also Payal et al. 2013 in India.

In polytrauma, 15 to 30% of deaths according to the authors are preventable (MacKenzie, 2006). The causes of preventable deaths in our series were: road safety instructions (wearing of seat belts in cars, wearing of helmets by motorcycle drivers) not observed. Motorcycles were involved in 66.66% of multiple injuries.

The failing pre-hospital health system, half of our polytrauma victims (52%) were transported to the hospital in cabs or private vehicles. The others were transported by non-medical ambulances, poorly equipped with unqualified personnel while it is reported that in severe trauma, 50% of deaths occur within the first hour, 30% the following hours and the remaining 20% after 24 hours (Sauaia, 1995).

In developed countries such as the United States where the mortality rate among polytrauma victims is much lower than ours (Claridge, 2000) to settle the problem of preventable deaths, the "trauma center" was created for more efficient.

Morbidity was marked by the occurrence of complications in 43.7% of our patients. This morbidity was dominated by nosocomial infections which occurred in 90.4% of them. These complications have prolonged the length of patient stays with a significant financial impact.

Prognostic factors

We noted in our research that a low Glasgow's score (GCS), bilateral mydriasis or anisocoria, was associated with death. Indeed pupil dilation accounts for a state of cerebral engagement and a GCS $\leq$ 8 is the clinical manifestation of severe brain damage. Several studies have noted that severe TCE is responsible for 68% of deaths in polytrauma patients (Krug, 2000; Cayten, 1991) and that mortality in polytrauma patients, when there is no hemorrhagic shock, depends on the severity of the initial intracranial pathology (Peytel, 2001).

The administration of vasoactive drugs was also associated with death in our research; its use is justified when one has a hypovolemic shock. The association of polytrauma shock is responsible for excess mortality (Caillot, 2016).

The other prognostic factors found were: Ventilatory support, administration of neurosedation and length of stay. All these parameters are related to a severe clinical condition, and have been found in the literature as being the prognostic factors for mortality (Tchaou, 2012; Maier, 2010).

CONCLUSION

Our study focused on polytrauma patients in the intensive care unit of the CNHU/HKM from January 1, 2013 to July 31, 2017. The frequency of polytrauma victims is relatively low 1.6%. The epidemiological profile of the polytrauma patients is young male adult of average age of 33.9 years, and most often victim of road accidents in 89.4%. Cranioencephalic trauma was the injury most associated with polytrauma. The mortality rate is high (45.8%). Factors associated with death were GCS, bilateral anisocoria or mydriasis, ventilatory support, neurosedation, vasoactive drug administration and length of stay. Part of the deaths was preventable and the causes were identified. The health authorities must provide appropriate responses with the development of the quality approach at the CNHU/HKM, equipment for resuscitation and the intensive care unit for emergencies, recruitment and training of health personnel, regular evaluation of professional practices (EPP) and an organizational reflection on pre-hospital medicine.

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