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Epidemiological Profile of ICU Mortality at the Lubumbashi University Teaching Hospital, Democratic Republic of the Congo

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Abstract: ***Purpose: ICUs are the places where patients requiring organ support are admitted, for this reason they are many deaths. The inefficiency of DR Congo health system and the deplorable socio-economic situation can affect the ICU outcomes. The aim of this study was to assess mortality risk factors in a polyvalent intensive care unit Methods: A retrospective cross sectional study was carried out on data collected from 2013 to 2015 in the Lubumbashi University Teaching Hospital ICU. Results: Of the 453 patients admitted to the unit, there were 198 deaths and a hospital mortality rate of 43.7 %. Mortality was significantly associated with source of admission (Internal Medicine, OR = 6.73 [2.64-17.15]), age (30-49 years: OR = 3.25[1.23-8.56], 50-69 years: OR = 4 [1.50-10.61], ≥70 years: OR = 3.6 [1.41-11.12]), Length of stay(<1day: OR = 11.73 [3.74-36.74]; 1-4 days: OR = 3.2 [1.60-5.70]); admission diagnoses including cardiovascular diseases (OR = 29.3 [7.95-186.63]), cranial trauma (OR = 18.3 [3.81-140.78]), infectious diseases (OR = 26.81 [7.14-172.80], tumor diseases (OR = 46,78 [9,47-368,65]), Acute Kidney Injury (OR = 34,25 [6,18-291,12]), and uncontrolled diabetes (OR = 27.75 [7.06-184.24]). Patients who were deceased were on average older than those who survived (48.46 ± 18.67 years versus 41.24 ± 20.39 years, p = 0.0001). Conclusion: Mortality in the UTH ICU in Lubumbashi is mainly due to non-communicable diseases, which therefore require special attention. Mortality is also associated with internal medicine source of admission and mostly with cardiovascular diseases and old age of patients.***

Keywords: Epidemiology, Mortality, Risk factors, ICU, Lubumbashi

1. Introduction

From the beginning, the purpose of the intensive care unit (ICU) has been to improve patient outcomes, morbidity and mortality associated with acute critically illness, trauma and major surgical procedures, and to maintain organ functions and restore health [1, 2]. Patients admitted to ICU are very heterogeneous; they can have multiple pathologies with different etiologies, severe co-morbidities, and are therefore likely to die despite technological and therapeutic advances especially if the patient care is not focused on vital functions restoration [1].

The Mortality in developing countries is higher than in developed countries. The causes of admission in the two situations are different both in their types and in their proportions. In developing countries, patients who are in severe critical conditions usually can't benefit from optimal therapeutic interventions. They have less chronic pathological history and suffer more from infectious pathologies [3].

ICUs are the places where patients requiring organ support are admitted, for this reason they are many deaths. In France, 75% of deaths occur in a healthcare facility, and in this country ICUs have a mortality rate of between 20 % and 50% [4]. In a study in intensive care for seventeen European countries, the intensive care unit mortality was 19.1% [5]. In the United States of America, approximately an estimated 4 million of people are admitted to ICUs with an average mortality rate of 8-19 %, or 500,000 deaths per year. This mortality is considered high for any situation or therapeutic intervention except for myocardial infarction for which the prognosis has improved [6, 7, 8].

Disease characteristics and mortality rates of patients admitted to ICUs in Sub-Saharan Africa vary widely from one population to another. In this part of the world, ICUs also vary in quality and quantity of infrastructure needed to provide adequate critical cares services [8]. The overall mortality rate across sub-Saharan Africa intensive care units ranges from 32 to 60% [9, 10, 11]. This rate depends rather on concerned study populations such as patients with cranio-encephalic trauma or suffering from a medical, obstetrical, neurological disease, and sepsis [12, 13]. In Burkina Faso, a mortality rate of 51.6% was observed in ICU, 43.7% in Uganda, 41.4% in Tanzania, 60.9% in Malawi and 86.6% in Kinshasa, the Democratic Republic of the Congo [14, 15, 16, 17, 18].

Mortality rates in ICUs are highly dependent on the disease severity and the patient's population. Lubumbashi, a

southern city of D R Congo appears to have a high mortality. Some studies on specific pathologies have been published in Lubumbashi, they have shown the magnitude of mortality in ICUs [19, 20]. In addition to the burden of infectious diseases that plagues the D.R.C health system, there is an emergence of acute or chronic non communicable diseases such as cardiovascular diseases, diabetes and tumor diseases. All these pathologies represent a real public health concern through their prevalence, and subsequent morbidity and mortality [21-23]. For many reasons, patients suffering from these diseases are admitted as emergencies and in advanced state of severity that requires hospitalization in ICU.

We have found no studies on epidemiological profile of ICU mortality in Lubumbashi. In addition, the health system in Lubumbashi and the DR Congo as a whole is inefficient given the non-existence of health insurance system for the entire population and the deplorable socio-economic situation for most of people [24]. All this may affect the outcome of patients admitted in intensive care units. A study on mortality is appropriate to assess outcomes of patients admitted to ICU and establish care strategies. We sought to describe the epidemiological profile of mortality and assess the mortality risk factors in intensive care units in Lubumbashi in order to improve patient's management strategies.

2. Methods

Study setting

This study was carried out in the polyvalent ICU of the University Teaching Hospital of Lubumbashi in the Democratic Republic of the Congo (D.R.C). This is an ICU with mixed patient populations both medical and surgical for all age. This hospital is a tertiary level structure in the country's health system. There are 211 functional beds while the total facility capacity is of 230 beds. The ICU is part of the anesthesia-intensive care medicine department and consists of 7 beds, which represent 3.3% of the capacity of the hospital.

Type of study

This is a cross-sectional descriptive study of all patients who died in ICU for a period of 3 years, from 1 January 2013 to 31 December 2015.

Study population and sampling

We selected patients from those admitted in ICU during the considered period. The parameters of study were age, gender, source of admission (coming place before admission to the ICU), mode of admission, diagnosis, outcome (death) and length of stay (LOS). Patient records whose parameters were deemed incomplete for this study were excluded.

Collection and analysis of data

Data was collected from medical records and patient files, encoded and analyzed using Epi Info® 7 and Excel 2007 software. Calculation of frequency, mean and standard deviation was performed. We also used the Yates-corrected chi-square test or the Fisher exact test when recommended. The odds ratio (OR) with 95 % confidence intervals was used to assess the relationship between risk factors and mortality. A p value less than 0.05 were considered significant.

Ethical aspects

The study was approved by the ethical committee of the University of Lubumbashi. Presentation of results is anonymous and data was kept confidential.

3. Results

Main features

During the study period, we admitted 564 patients, of whom 453 patients were selected, 198 died, representing a mortality rate of 43.7%. Two hundred and seventy-seven patients (61.1%) were male and 176 (38.9%) female, with a sex ratio M / F of 2/1. The mean age was 44.4 ± 19.6 years. The majority (53.2 %) of patients came from the emergency department and 21.2% from the internal medicine department. The average length of stay was 4.64 days.

Factors associated with mortality

Table 1: Factors associated with mortality in intensive care unit

Variables	Death (n=198)		Survival (n=255)		Total (n=453)	OR	IC95%
Source of admission							
Internal Medicine	70	72.2%	26	27.08%	96	12.62	6.20-25.70
Gynecology-Obstetrics	8	28.57%	20	71.43%	28	1.95	0.72-5.24
Emergency	105	43.57%	136	56.43%	241	3.76	2.04-6.92
Surgery	15	19,79%	73	80.21%	88	-	-
Age							
<18 years	6	22.22%	21	77.78%	27	1.00	
18-29 years	29	27.10%	78	72.90%	107	1.30	0.48-3.55
30-49 years	65	48.15%	70	51.85%	135	3,25	1.23-8.56
50-69 years	64	53.33%	56	46.67%	120	4.00	1.51-10.61
≥70 years	34	53.13%	30	46.88%	64	3.97	1.41-11.13
Mean	48.46±18.67		41.21±20.39		p<0,0001		
Gender							
Male	119	42.96%	158	57.04%	277	1.00	
Female	79	44.89%	97	55.11%	176	1.08	0.74-1.58
Length of Stay							
< 1 day	20	80.00%	5	20.00%	25	11.73	3.74-36.75
1-4 days	131	50.78%	127	49.22%	258	3.02	1.60-5.70

5-9 days	32	28.83%	79	71.17%	111	1.18	0.58-2.43
>9 days	15	25.42%	44	74.58%	59	1.00	
Mean	3.53±3.01		5.50±3.45				p<0.0001
Mode of admission							
Direct	105	43.57%	136	56,43%	241	1,00	
Indirect	93	43,87%	119	56,13%	212	1,01	0,69-1,46
Diagnostic of admission							
Surgicaly diseases	2	4,00%	48	96.00%	50	1	
cardiovascular diseases	67	55.37%	54	44.63%	121	29.3	7.95-186.63
Cranial Trauma	9	45.00%	11	55.00%	20	18.5	3.81-140.78
Infection	49	53.26%	43	46.74%	92	26.81	7.14-172.80
Intoxication	1	9.09%	10	90.91%	11	2.35	0.07-33.60
Tumor diseases	13	68.42%	6	31.58%	19	46.78	9.47-368.65
Complications of pregnancy	1	9.09%	10	90.91%	11	2.35	0.07-33.60
Kidney Injury	8	61.54%	5	38.46%	13	34.25	6.18-291.12
Respiratory diseases	3	33.33%	6	66.67%	9	11.13	1.40-109.84
Trauma	8	22.22%	28	77.78%	36	6.7	1.22-69.16
Uncontrolled Diabetes	31	54.39%	26	45.61%	57	27.73	7.06-184.24
Others	6	42.86%	8	57.14%	14	16.74	3.00-138.54

1. Mortality and hospital source before admission

The death rate was 72.92 % for patients from internal medicine department, 43.57 % for those coming from emergencies department, 28.57 % for those referred from gynecology-obstetrics department, and 19.79 % for patients from surgery department. Patients from internal medicine department had 6.7 times the risk of death than those from surgery department (OR = 6.73 [2.64-17.15]).

2. Mortality and age

One out of two patients died in the 30-49, 50-69 and ≥ 70 years age groups, while in the under-18 and 18-29 age groups, death rate was 22.22 % and 271%, respectively. Mortality was increased proportionately with age and this in a statically significant way. The mean age in deceased patients was 48.46 ± 18.67 years and 41.21 ± 20.39 years in surviving patients. The difference was highly significant (p <0.0001).

3. Mortality and gender

Among the deceased, there were 119 out of 277 males, i.e. 42.97 % and 79 out of 176 females, i.e. 44.89 %. There was no statistically significant association between sex and mortality in ICU (OR = 1.08[0.73-1.58]).

4. Mortality and length of stay (LOS)

A stay of 4 days or less was significantly associated with a high mortality rate. We recorded 80 % and 50.78 % respectively of deaths in patients whose the LOS was less than 24 hours and 1 to 4 days. The mean LOS of the deceased patients was significantly shorter (3.53 ± 3.01 days) than that of the surviving patients (5.54 ± 3.45 days), and the difference was highly significant (p <0.0001).

5. Mortality and admission diagnosis

As for the admission diagnosis, we noted that mortality was significantly associated with cardiovascular disease (OR = 29.3 [7.95-186.63]), cranial trauma (OR = 18.3 [3, 81-140,78]), infectious diseases (OR = 26,81 [7,14-172,80]), tumoral diseases (OR = 46,78 [9,47-368,65]), Kidney Injury (OR = 34.25 [6.18-291.12]) and uncontrolled diabetes mellitus (OR = 27.75 [7.06-184.24]).

Patients admitted to the intensive care unit are treated with perfusion (Ringer Lactate, NaCl 0.9 %, G5% and G10%), blood transfusion with whole blood, antibiotics (Augmentin Amoxycilin, Cefotaxin, Ceftriaxone, Ciprofloxacin, Gentamycin, Metronidazol…), Mannitol 20%, Vasopressors(Ephedrine, Adrenaline, Dopamine, dobutamine), Antihypertensive drugs(Captopril, clonidin, amlodipine,…), diuretics (Furosemide, spironolactone), Non Invasive Ventilation with Face Mask or Nasal Spectales, Oxygenothérapy, Diet measurement, Physiotherapy, General Nursing Measurement. The type of Intensive care unit is the closed-ICU.

4. Discussion

This study reveals a mortality rate of 43.7% in the Lubumbashi UTH ICU. This mortality appears to be identical to that observed by Kruisselbrink et al., in Uganda (43.7%) [14]. Those two rates are higher than those reported by many authors: El-Fakhouri et al., in Brazil (24.32%) [25], Tanriover et al., in Turkey (25.6%)[26], Onyekwulu in Nigeria (34.6%)[27], Aboubakar et al., in Cameroon (35%)[28], Agalu et al., in Ethiopia (37.7%)[29], Kwizera et al., in Uganda (40.1%) [30] and by Sawe et al., in Tanzania (41.4%) [16]. However, our results are lower than those reported by Bonkoungou et al., in Burkina Faso and by Gundo et al., in Malawi, who found 51.6% and 60.9% respectively [11,14]. This high mortality in our study could be explained by poor therapeutic observance due to the precarious socio-economic situation of the population, the poverty of the patients, the absence of social insurance system, which limit access to medicines and other consumables entering the care process, and late presentation to hospital, leading to late care. The inadequacy of basic equipment and qualified medical and nursing personnel and problems related to organizational aspects of the ICU contribute to the worsening of this situation which has been observed by many other studies in sub-Saharan Africa [10, 14, 28, 31, 32]. Delayed transfers or late consultations on arrival of patients in our hospital could be a factor explaining the severity of illness in these patients. Thus, it is difficult to assess these patients based on the usual evaluation scores applicable in the ICU; and the lack of adequate equipment constitutes a poor prognostic factor.

This problem is quite frequent in most ICU in DR Congo, as noted by Mejeni et al. at the University Teaching Hospital of Kinshasa, and like in most countries in sub-Saharan Africa [11, 16,18].

In this study, admissions from internal medicine were significantly associated with mortality when compared with admissions from other services. Our results corroborate those reported by Du et al., in China [34]. It should be noted that some authors have had to carry out comparative studies concerning the impact of the source of patients admitted to the ICU on the mortality; for them, the emergency service had a higher mortality than those of patients from other services [35]. Concerning our ICU, this could be explained by the fact that patients from the medical service are often transferred a longtime after care management failure due to multiple co-morbidities that have taken place during hospitalization. Sometimes the purpose of admission in ICU is the isolation from relatives. Our results also show a high mortality rate for patients admitted from the emergency service. This could again be explained by the fact that patients admitted late to the emergency service, often at the terminal stage, have fatal outcomes when they are later on transferred to ICU.

The mean age of patients who died was 48.46 ± 18.1 years. The mortality of our patients was higher in the 30-49 years group with 48.15%, 50-69 years group with 53.33%, and 70 years and more groups with 53.13%; thus, mortality seems to increase with age. Omar et al. reported a mean age of 60.35 ± 17.3 years with a high mortality rate in the age group beyond 70 years [36]. The result of our study could be explained by the fact that the level of life expectancy of our populations in Africa is low according to the 2015 Human Development Index (HDI) report and several authors stipulate that young people would be more exposed to traumatic diseases and those related to HIV / AIDS, the causal elements of most deaths in our environment. [16, 29, 37, 38].

In our series a sex ratio of 2/1 was observed and no significant difference was observed between sex and the occurrence of mortality. Contrary to our results some studies showed relations with sex and mortality [39-41]. Gender is also a factor that can influence the outcome of critical patients admitted to the ICU, in term of the role it could play in the patient's immune response [42, 43]. Other authors have pointed out that gender may be a factor influencing the expression, evolution and outcome of several common medical situations, but also pharmacokinetics and treatment response [38]. Some believe that women have a greater chance of surviving in the event of serious illness than men, but the fact that they would consult late would be a disadvantage for women [38, 43, 44]. The mortality rate according to sex differs from one pathology to another, some of which lead to fatal outcomes for female patients [40,43]. In this regard, men may be susceptible to septic complications than women, prognosis is better for young women than men in case of trauma whereas it is more fatal in women in cardiovascular disease [45, 46].

Regarding the length of stay (LOS) of patients, 5.52% of our patients were hospitalized for less than 24 hours and 80% of these patients died within this period. Some authors such as Onyekwulu and Anya in Nigeria, Arabi et al. in Saudi Arabia reported that respectively 8.6% and 27.8% of their patients were admitted in less than 24 hours with a mortality rate of 66.7 % and 26.3% [27.47]. The risk of death during the 24 hours after admission was 11.73 times greater and between 1 and 4 days of hospitalization 3.02 times greater than the risk of death after 9 days of hospitalization. Thus, the long period of hospitalization was correlated to greater chance to survive. Many studies have also found that patients admitted to intensive care have a higher mortality rate early after admission, generally before 6 days and beyond that period patient have the chance to survive [11, 14, 30]. Our results contrast with those of other authors [35, 48, 49]. In our study, patients who died within 4 days after admission were moribund patients who had generally lost a lot of time before accessing medical care service or lacked financial resources to access Health care. In this group, there were patients who were lately transferred to ICU by either other clinics or various services of the hospital, so that these patients were often admitted in terminal stage with an advanced severity leading earlier to a fatal outcome. It is estimated that a delay of more than six hours of admission to intensive care from the onset of a serious illness leads to a high probability of mortality [41]. Added to this is a lack of material, human resources and organizational problems in the policy of admission to ICU.

In this study, mortality was statistically associated with certain admission diagnoses including cardiovascular diseases, stroke particularly, infectious diseases (sepsis, cerebral malaria and HIV / AIDS), tumor diseases, kidney failure and unbalanced diabetes. These findings seem to confirm those of the study of Mukeng et al. [20] in Lubumbashi and are similar to other studies elsewhere [4, 25, 35, 51]. As a result, our study indicates that non-communicable diseases, due to their associated prevalence, morbidity and mortality, indicate an emerging epidemic of these diseases following the westernization of the urban lifestyle that is becoming a real public health problem besides the existing infectious diseases. They are therefore a predictive factor in the mortality of patients admitted to ICU in Lubumbashi.

5. Conclusion

The mortality rate was 43.7% and is among the highest mortality rates in ICUs in low-income countries. Admission from the internal medicine service was associated with high mortality compared to other sources of admission. In addition, mortality increased with age and death occurred prematurely a few hours to a few days after admission. Non-communicable diseases were the leading causes of death in ICU.

Efforts in the control of non-communicable diseases on the whole as well as appropriate ICU equipment improvement of technical expertise, resulting in better care of abovementioned diseases are needed in order to minimize death risk factors impact in our environment. Further investigations on these diseases responsible for death in ICU are recommended. The country need to set up an intensive care medicine training program to produce intensive care

physicians and nurses for the ICUs should be put in place to help improve the outcome of patents.

6. Conflict of interest

We declare that we have no conflict of interest in the completion of this work.

7. Contribution of Authors

All the authors contributed to this study.

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