



RESEARCH ARTICLE

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CLINICAL AND EPIDEMIOLOGICAL CHARACTERISTICS OF BURN INFECTION IN ADULT PATIENTS

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ARTICLE INFO

Article History:

Received 20th August, 2019

Received in revised form

11th September, 2019

Accepted 27th October, 2019

Published online 30th November, 2019

Key Words:

Adult burns,
Nosocomial infection.

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ABSTRACT

Introduction: The reported rate of infection in the burn units varies considerably. In the new Provincial Burn Unit in Santiago de Cuba, Cuba there is no data available on the infection. **Objective:** This study characterized the infection from a clinical and epidemiological point of view. **Methodology:** It was a descriptive, longitudinal and prospective study of adult burn patients with nosocomial infection hospitalized at the Burns Department of Santiago de Cuba from September 2011 to August 2013. The database generated from a survey was processed using Excel version 8.0 and the resulting information was analyzed by the SPSS version 20 statistical program. The χ^2 test was used to identify factors related to nosocomial infections, taking into account a significance level of 5%. **Results:** An infection rate (29%) was found to be higher than those found in the literature; and influenced by several modifiable and non-modifiable factors. **Conclusion:** Signs of infection were considered nonspecific for his diagnosis. The service has had information for decision-making regarding the measures against infection.

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Citation: Dembélé Bertin, Daou Moussa Baba, Dembélé Niaré Fanta, Macías Navarro Meydis et al. 2019. "Clinical and epidemiological characteristics of burn infection in adult patients", *International Journal of Development Research*, 09, (11), 31516-31518.

INTRODUCTION

Skin burns are due to the direct application of heat, cold or chemicals and their severity is proportional to the time of exposure, the thickness of the skin affected, the causative agent and the temperature applied (Dautant *et al*, 2007). The experience accumulated over the last three decades in the early treatment of patients with burns has radically changed the cause of death. It is now estimated that about 75% of post-burn mortality is related to infections, instead of osmotic shock and hypovolemia (Lessa, Rose, Castro, 2009). The burned tissue has favorable conditions for bacterial colonization, such as the presence of non-viable tissue rich in coagulated proteins and serum transudation and blood, in addition to the lack of vascularization, the slough does not allow the diffusion of systemic antimicrobials and even worse if there is a drop in serum proteins especially albumin (Rangel, 2015).

The rate of infection reported in burn units varies considerably, due to different criteria used to make their diagnosis. In the US, this rate was 13% of all patients hospitalized between 2003 and 2012 while it was 19% of patients hospitalized in French Burn Treatment Centers during the summer of 2006 (Lefloch, Naux, Amould, 2015). In Africa, in a study conducted by Siah *et al*. in Morocco, intra-hospital infection was 32% in the study population (Siah *et al*, 2009); and another author in Mali reports that 5.7% of their cases had an infection of which 33.3% of deaths were due to sepsis (Bagayoko, 2007). In Latin America, infection causes 50 to 60% of the deaths of burn patients (Rosanova, Stambulian, Lede, 2013). Morales in his work in Colombia reports an incidence of 12.9% (Morales *et al*, 2010). León in Havana said that the morbidity due to sepsis was 24.3% in the entire of his sample and sepsis mortality of 72% (León, 2010). In the new Provincial Burn Unit in Santiago de Cuba, Cuba, there is no

data available on the infection that is currently the leading cause of morbidity and mortality in burns; This led us to make this study with the objective of characterizing the infection from the clinical and epidemiological point of view in order to have statistical data concerning it but also to facilitate decision-making in this regard.

METHODOLOGY

This was a descriptive, longitudinal and prospective study carried up in adult burn patients with nosocomial infections hospitalized at the Burns Department of Santiago de Cuba from September 2011 to August 2013. The study population consisted of all burned adults (200 cases) admitted to the service. All cases of nosocomial infection were included (53 patients). Cases those were not presenting with this type of infection, those with an infection at the time of admission, those with conditions such as diabetes mellitus, HIV / AIDS or any other that could have compromised immune system or that by their nature would have an influence on susceptibility to infection were excluded. Patients with less than 48 hours of service and those of the Trocha accident were also excluded. The project's study had been validated by the competent authorities and informed consent of the patients was obtained. A questionnaire containing socio-demographic and clinical data was used to collect data from all patients. The generated database was processed using version 8.0 of the Excel software and the information obtained was analyzed by SPSS version 20 statistical program. The statistical test used was that of X^2 in search of factors related to nosocomial infections and taking into account a significance level of 5%. The summary of the data was done through the mean and standard deviation by the quantitative variables and the percentage for the qualitative ones.

RESULTS

In this study, 58 cases of infection were collected, representing 29% of all 200 patients admitted in to the service. The sex ratio was 1.22 in favor of the female. In the same way, a high number of women (55%) had made the infection. The mean age observed in patients was 46 years with a standard deviation (SD) of 20.55 and a confidence interval (CI) = 40.77-51.58. The infection predominated in patients of rural origin in 45% of cases followed by those of semi-urban origin in 31% of patients. Urban patients were the least affected at 24%. Statistically, there was no difference between the patients to do or not the infection taking into account their origin ($p = 0.37$). The most indiscriminate factors in our patients were the flame with 86% of cases followed by hot liquids with only 14% (Table 1). There was no infection in electrical burns nor in the chemicals ones. According to the data obtained, 71% of the patients with infection had a hypodermic burn, 26% a deep dermal burn and only 3% have had superficial dermal burn. It was observed that the depth of the burns is related to the predisposition to the infection. (Table 2: $p = 0.000$). The catheterization in the patients was related with the infection ($p = 0.003$) of order of 62% in the patients in whom the central catheterization was used, 28% for those of peripheral one and in 10% of the patients in whom no pathway was used presented the infection (Table 3). Significant signs of infection in patients were leukocytosis (91%), tachycardia (86%) and polypnea (72%), in which case a value of $p = 0.000$ was found (Table 4).

Table 1. Patient's relations according to ethiological agent

Etiological Agent	Amount	Percent
Flame	50	86
Hot liquid	8	14
Chemical agents	0	0
Electricity	0	0
TOTAL	58	100

Source: Data collection form burns patients
 $p = 0,003$

Table 2. Patient's relations according to burns depth

Burns depth	Amount	Percent
Superficial Dermal	2	3
Deep dermal	15	26
Hypodermic B	41	71
Total	58	100

Source: Data collection form burns patients
 $p = 0.000$

Table 3. Patient's relations according to catheterization or not

Catheterisation	Amount	Percent
None	6	10
Peripheral catheterization	16	28
Central catheterization	36	62
Total	58	100
TOTAL	58	100

Source: Data collection form burns patients
 $p=0.003$

Table 4. Patient's relations according to Signs of infection

Signs of infection	Amount	Percent
Leukocytosis	53	91
Tachycardia	50	86
Polypnea	42	72
Hyperthermia	39	67
Localized oedema	38	65
Perilesional oedema	36	62
Exudate	33	57
Perilesional erythema	33	57
Colour change	26	45
Disorientation	23	40

Source: Data collection form burns patients
 $p=0.000$

DISCUSSION

Many infections are cutaneous or cutaneous gateway. If the surface bacteria are destroyed at the time of the burn, those located at depth cutaneous appendages are at least partly respected. The burn, sterile in the first hours, is quickly colonized, initially within 48 hours by cutaneous bacteria (gram-positive cocci essentially) and then at the end of the first week by bacteria that can be of digestive origin, otolaryngology or environmental as well as by funguses (Lefloch, Naux, Amould, 2015). Other factors such as sex, age, the etiological agent, the origin of the patients, the procedures related to the care of the patients, the depth as well as the extent of the burns would also have a great influence to contract nosocomial infections by burn patients. Differences in susceptibility to infection between the sexes, possibly related to gonad, hypothalamic and pituitary hormones, have been demonstrated, showing a decrease in the immune response to increased testosterone; conversely, the increase in estrogen and prolactin levels reinforces this response (Vargas *et al*, 2009).

In this study 58 patients (29%) presented infections, there was a greater number of infected female patients (55%) for a $p = 0.451$, a figure that does not reveal a sex relationship with infection but also a higher number of the female sex does not confirm the hormonal theory mentioned previously. However, these results are similar to the data presented by Ulloa in 2012, after a similar study in Chile, with a distribution of 48.6% of the male sex (Ulloa *et al.*, 2012). Contrary to the results of this study, in a study conducted in Argentina by Rosanova *et al.*, the male had a higher risk of infection, with a distribution of 66% (Rosanova, Stambulian, Lede, 2013).

Septic complications in burns occur more frequently in the extreme ages of life; at the child because of weak development of its immune system fundamentally and at adults towards the old age because of the diminution of the defensive mechanisms of the organism (Duran, 2009). It was observed in this study, an average age of 46 years (with a $SD = 20.55$ and $CI = 40.77-51.58$) data that would coincide with those of Manach if we take into account the upper limit of 66 years (Manack, 2007). Regarding the results of the area of origin, we cannot compare it to other studies for not finding in the literature. Although it has a $p = 0.003$ showing an associative influence of the cause of the burn with the infection, it cannot be ruled out that this relationship is influenced by other factors. Rosanova *et al.* in 2013 in Argentina found no association between etiologic agent and infection according to their study (Rosanova, Stambulian, Lede, 2013). It should be noted that the depth of burns statistically has an excellent relationship with infection where at greater depth a greater possibility of infection for a $p = 0.000$. In Morales *et al.* work's in 2010 (Morales *et al.*, 2010), in Colombia, the incidence of infections in deep second degree burns was higher (53.2%). In Chile, Ulloa in 2012 reported a 77.5% of infection for patients of similar depth (Ulloa *et al.*, 2012). On the other hand, in a study conducted in Argentina, the presence of infection was significantly associated with hypodermic B burns (43% versus only 4% without infection) (Rosanova, Stambulian, Lede, 2013). Infections associated with catheters are a major problem in intensive care units, accounting for 10% to 15% of intra-hospital infections (Buggedo, Castillo). In this study there was an influence on the onset of infection in burn patients with a p value of 0.003. This value is most in favor of central catheterization in which 62% of infected patients had this condition. The infection of the burn wound is difficult to interpret, so any changes that may reflect the infection should be monitored. In any case, from a statistical point of view, there was a relationship of signs with the infection with $p = 0.000$. The signs of infection observed may be nonspecific and most of them are present in infected and uninfected patients, albeit at different degrees. This may mean that they are not sufficient for the diagnosis of infections because these signs are also present in entities such as non-infectious or traumatic systemic inflammatory response syndrome.

Conclusion

In this study, it was found a higher infection rate than most of those found in the literature; and influenced by several modifiable and non-modifiable factors which will allow as acting on the modifiable in order to reduce morbidity and mortality related to infection in the service.

It appears that the signs of the infection may be nonspecific for its diagnosis because they are also present in entities such as non-infectious or traumatic systemic inflammatory response syndrome, hence the need to go to more specific tests for the diagnosis despite the limit of means.

Conflict of interest: The authors declare no conflict of interest

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