Objectivo: Determinar la prevalencia de especies bacterianas en úlceras por presión (UP) en pacientes con lesión raquídea y lesión de la medula espinal (LME) tratados por una Asociación de Discapacitados Físicos. Método: Estudio descriptivo, transversal, cuantitativo, realizado en una ciudad del noreste en 2009 – 2010. La muestra fue no probabilística, se seleccionó a 20 pacientes con lesión raquídea y 20 con lesión de la medula espinal, con y sin tratamiento antibiótico, que permanecieron en la asociación y colaboraron con los protocolos de tratamiento. Se colectó muestras de exudados de las UP, utilizando torundas estériles, sembradas en placas de Agar Sangue y incubadas a 35°C durante 24 horas. Para identificación de los microorganismos, se emplazaron en placas de Agar Sangue, sábanas y sin uso de antibioterapia. Se recogieron muestras de exudados de la UP, utilizando torundas estériles, sembradas en placas de Agar Sangue y incubadas a 35°C durante 24 horas. Para identificación de los microorganismos, se emplearon bioquímicos. Se utilizó estadística descriptiva para el análisis de datos. Resultados: Los seis microorganismos encontrados fueron: S. aureus, S. epidermidis, S. saprophyticus, Proteus spp., Escherichia coli y Enterobacter spp. Conclusión: Investigaciones microbiológicas prospectivas adicionales son necesarias para evaluar la prevalencia de los patógenos de UP en pacientes lesionados, a fin de instituir programas educacionales, nutricionales y terapéuticos que reduzcan la colonización y la infección bacteriana. Descriptores: Úlceras por presión, Microbiología, Traumatismos de la medula espinal.
The spinal cord injury can affect neural structures such as bone marrow, the conus medullaris and the cauda equina. This type of injury is considered a serious affliction to human beings and studies with high physical and psychosocial burden.\(^1\)\(^2\) It is characterized by a neurological spinal cord aggression that, medically, can result in loss of voluntary movements and/or sensitivity at levels below the body segment where the injury occurred.\(^2\)

Brazil presents the second highest incidence of spinal cord injury (SCI) in the world. There are about six to eight thousand new cases per year, among which 80% are represented by male victims aged between 10 to 30 years old.\(^3\) However, studies indicate that the Brazilian coefficient of incidence of traumatic spinal cord injury lacks accuracy, since there is no accurate data for incidence and prevalence due to underreporting of data.\(^3\)\(^4\)

The SCIs can attend with the onset of complications and overhead compromises, such as autonomic dysreflexia, postural hypotension, Heterotopic ossification, contractures, deep vein thrombosis, pain syndromes (pain, pain in traumatic nerve root, among others), osteoporosis, kidney stones and, mainly, decubitus ulcers or pressure ulcers (UP)\(^5\).

The National Pressure Ulcer Advisory Panel (NPUAP) sets UP as an area of cell death that occurs contact compression of soft tissue, between a bony prominence and a hard surface, for an extended period of time. Friction, the decrease in sensitivity, the immobility and nutritional status are highlighted as potential risk factors for the development of UP, as well as skin exposure to excessive humidity, caused mainly by urinary incontinence and perspiration.\(^6\)\(^7\)

Pressure ulcers (UP) are a growing concern in clinical practice. NPUAP data indicate a prevalence of 15% and 7% incidence of UPs in North American hospitals, 60 thousand patients die each year due to complications of this injury.\(^8\)\(^9\) Although there are few Brazilian data, a study in a university hospital showed an incidence of 41.02\%.\(^10\) However, after implementation of protocols for risk assessment and prevention of pressure ulcer in the institution the index dropped to 23.1\%.\(^11\) It is worth mentioning that the incidence rates and prevalence are due to the characteristics of patients and the type of assistance provided, that is, long-stay care or acute and home care.

Involving skin and adjacent tissues, UP causes a poor blood circulation which culminates in necrosis, ulceration of the skin and other tissues and chronic secondary infection. These changes make it favorable to the development of microorganisms due to exudative material, serous, crusted or hemorrhagic present on the surface of the UP.\(^12\) In this context, bacterial contamination of chronic ulcers, especially those UPs is a universal and inevitable occurrence.\(^13\)

To do so, the decision trees or algorithm propose a sequence of events related to the management and integral care of individual with UP. This includes nutritional data at
overload monitoring of tissues with pressure reduction and, especially, control of bacterial colonization and infection.\textsuperscript{13}

It should be noted that in addition to the stigma of rehab, the reduction in the quality of life is driven by ignorance of this injury, which carries a deficiency in these patients' self-care.\textsuperscript{14–15} To assess the rehabilitation process of these subjects, a study used a psychosocial approach that, in addition to including variables, pain management, prevention of UP, skin care skin integrity and control of bladder emptying, provided a means of social reintegration.\textsuperscript{15} This approach should involve multidisciplinary care psychosocial simultaneously and integrated with patients injured in order to promote proper social rehabilitation, greater survival and better quality of life during and after the therapy instituted.\textsuperscript{1,16} In addition to the assessment of contaminant microbiota or transient UPs cannot be justified, therefore, only in the face of increased patient survival and greater accuracy in the treatment of them but, above all, in terms of quality of life during and after treatment.

The objective of this study was to determine the prevalence of bacterial species on pressure ulcers to patients with spinal medullar injury, assisted by an association of disabled people.

**METHOD**

This study presents descriptive cross-sectional delineation and quantitative approach. It was held in an association of disabled people located in a capital city of the northeastern region, with the outcome variables processed in the laboratory of Microbiology, Faculty of Biological Sciences and Health (FCBS) CESMAC University Center. The period of investigation was from August 2009 to July 2010.

Prioritizing ethical integrity seeking subjects involved in research and, in accordance with the guidelines established in the resolution 196/96, the National Health Council, the present study has obtained approval by the Research Ethics Committee of the University Center CESMAC Faculty of Biological Sciences and Health, process under number 440/08.

The inclusion criteria set in the investigation were individuals with spinal medullar injury and with pressure ulcer and without use of antibiotic therapy. The sample was non-probability type in succession, and for convenience, and understood 20 subjects, who have agreed to participate voluntarily by clarifications concerning the research study and after signing the informed consent (TFCC).

Pressure ulcers (UP) have been classified in accordance with the guideline of the National Pressure Ulcer Advisory Panel (NPUAP), in Portuguese language, developed to assist health care professionals in decision making in relation to the resources and circumstances available in specific clinical situations. This recommendation brings the proposed classification of UPs in: Level I - injuries limited to epidermis and superficial Dermis; Level II - involving skin and subcutaneous tissue; Level III - extending to the muscles; Level IV - injured tissues and involvement of bones and joints.\textsuperscript{6}
The UPs have been measured according to the parameters of length versus width by specific rule. For Level III and IV ulcers, the depth criterion was conducted by one swab sterile. In addition the largest dimensions for irregular wounds were standardized. 17-18

For collection of biological material, exudate samples were used from the surface of the UPs via one swab with sterile cotton and kept in blood agar medium at room temperature, and then incubated at 37°C for 24 to 48 hours. In case of possible presence of necrotic material, exudate was disposed and collected by the edges and depth of the lesion.

In order to determine the prevalence and identify microorganisms in biological samples of the subjects of the research, we conducted a bibliographic survey, based on current scientific literature, which legitimized through biochemical tests, the following bacterial species: Staphylococcus aureus, Staphylococcus epidermidis, Staphylococcus saprophyticus, Escherichia coli and Proteus SSP. 19-20 The colonies were identified by the method of Gram and thus the gram-negative bacteria were peaked in MacConkey Agar and the Müller-Hinton agar positive (MH). For isolation and identification of species, it the biochemical tests were used: testing catalase, oxidase, motility, DNAse, urease, H2O, indole; sucrose, citrate, lysine and lactose.

The analysis of the data collected was done through Data Analysis and Statistical Software program (STATA) version 9.0. We proceeded to the descriptive statistics (relative frequency (Fr), absolute frequency (%), average, median, standard deviation, minimum and maximum value) to characterize the sample of the study, as well as to determine the prevalence of bacterial species in the UPs. The normal distribution of the data was checked by the Kolmorogov-Smirnov test with α fixed at 5%, CI 95%.

Among the 73 patients who presented some type of spinal cord injury at the time of the survey, only 20 (27%) showed UP, such patients composed the final sample of the study. Clinical and demographic characteristics are represented in table 1.

Table 1. Clinical characteristics of patients with SCI assisted by an Association of disabled people located in a capital city of the northeastern region (n = 20)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>n</th>
<th>%</th>
<th>X(±SD)</th>
<th>MD</th>
<th>Min.</th>
<th>Máx.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>17</td>
<td>86</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>3</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Age (years old)</td>
<td></td>
<td></td>
<td>24(±7)</td>
<td>21</td>
<td>15</td>
<td>42</td>
</tr>
<tr>
<td>15-25</td>
<td>13</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26-35</td>
<td>6</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥36</td>
<td>1</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanism of spinal cord injury</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firearm</td>
<td>14</td>
<td>70</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car Accident</td>
<td>5</td>
<td>25</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

RESULTS AND DISCUSSION

(Continued)
There was a predominance of the male 86% (n = 17) with spinal cord injury, corroborating findings from other studies that showed a prevalence of young males and whose spinal injuries in 70% of cases affecting young people aged 17 to 25 years old.⁴, ⁹, ²¹ A study conducted recently with 295 patients showed that their average age was 49.1 years old, with a standard deviation of approximately 18.6 years old, and minimum ages 18 years old and a maximum of 87 years old. As for sex, the same study pointed out that 55% (n = 162) were male.²²

The prevalence of patients with spinal medullar trauma accompanied by UPs was considered low when considered the total number of patients with SCI (n = 73), i.e. only 27%. This finding contrasts the data of some scholars who identified 70% UP on patients assisted in rehabilitation centers.²³ In a survey in the General Hospital of Maceió, with 232 patients, it was found a high prevalence of UPs (65.1%) and an extended period of hospitalization (20.9 days).²¹

The constant monitoring of patients by the staff of the institution studied physiotherapy may have minimized the possibility of recurrence of UPs, given that 73% (n = 53) of patients with spinal cord injury, not developed this complication. Physiotherapy has a substantial role in the treatment of spinal cord injuries, as it provides an adequate mobility and sensitivity through the change of decubitus on bone protrusions, as well as the
management of neuromotor stimulus manoeuvres of muscle blocks of spinal cord injury and ulcers. It should be noted that some variables interfere in risk reduction, development of UPs and infection of the UPs. Among these variables, we highlight the focus on interdisciplinarity, personalized care and the level of knowledge and decisions of the patient and his family. Contiguous efforts of professionals and family members, both within and outside the health care institution, promotes the improvement and/or rehabilitation of diminished or lost functions that are indispensable for the survival and quality of life of injured Medullary.

The firearm injury is highlighted among the mechanisms of spinal cord injury, a fact which is also reported by other studies. SCI cases by firearm are generally in virtue of urban violence, which makes the service more frequent hospital centres and has a burden to society. The path that the projectile follows can injure numerous other structures such as abdominal and thoracic viscera, neural, vascular structures and cardio-pulmonary lesions of thoracic viscera sit-ups are devoid of sensitivity, which can complicate the diagnosis. Thus, the surgical indications are controversial, and there is a scientific consensus of conservative therapy, in most cases. On the type of spinal cord injury, paraplegia 60% (n = 12) stood out as the most prevalent lesion type, followed by the tetraplegia 29% (n = 5) presenting, so similarities to some studies. In paraplegia, spinal level more injured is the thoracic-lumbar, causing a neural deficit in this area.

Regarding UPs therapy, saline and essential fatty acids (AGE) 40% (n = 8) were the most widely used. These solutions are distributed for free by the institution where the research was conducted. It is known that the AGE promotes chemotaxis, angiogenesis and accelerates tissular granulation process. Although this substance is widely used in Brazil, there are few studies that discuss its use on wounds, and there is a dearth of randomized controlled clinical trials. The AGE recommendation, for different types of injuries, since UPs until surgical wounds, is indicated when associated with other substances. Patients in this study reported the use of AGE and concomitant saline solution the use of herbal remedies as sambacaitá (Hyptis pectinata) and stone hune. The species Hyptis pectinata is popularly known as sambacaitá, used in the States of Sergipe and Alagoas, for therapy of inflammations, bacterial infection and pain. The stone hune is an inorganic salt, potassium sulphate-aluminic, employed as blood coagulator of minor cuts. However, it should be noted that there is no scientific evidence available that legitimate the effectiveness of herbal medicines in the treatment of UPs or other ulcers. The need for a therapeutic UP arises when prevention measures are inadequate. A Chilean hospital proposed in the 90, a program for the prevention of UPs, where among the measures deployed have excelled those based on periodic visits, health education of caregivers at home and regular examinations.

The guidelines for the prevention of UPs suggest to patients, caregivers and healthcare professionals, to assess risks, regularly inspect the skin, relieve pressure on the affected area, to establish adequate hydration and nutrition, in addition to continuing education. In this sense, the UP is associated with reduced quality of life in the psychosocial aspect, although the injury is preventable. However, prevention measures are still precarious.
A current scientific research reported that only 19% of patients medullary injured had appropriate precautions measures of UPs. Patients at intensive care units may have the skin care overshadowed at the expense of demands on the respiratory system, breathing and circulation. The areas most affected by UPs were the areas trochanter, 50% (n = 10), sacral and Ischia 20% (n = 4). Together, these areas accounted for 90% of the local development of UPs in individuals. Those numbers of UPs were estimated, as we see in some studies5,34 because most vulnerable bone protrusions are: ischium (24%), Sacral (23%), trochanter (15%), heels (8%), malleolus (7%), knee (6%), iliac crest (4%), region of the elbow (3%), prominence of the tibia (2%), spinous process occiput (1%), Chin (0.5%) and scapula (0.5%).

Calcaneal region 49% (n = 23) was demonstrated as the most affected in recent study. Even though other researchers have reported 12 other frequent locations of UPs as the ischial tuberosity (24%), sacrococygeal (23%), 15%), a calcaneal trochanteric 8 (%), lateral malleoli (7%), elbows (3%), occipital region (1%) and scapular region (1%).

The predominance of UPs in those regions is characterized by functionality of the bony structures of the patient support, either sitting or lying supine or side, as well as the interface of these long bones with numerous muscles. In addition, there is a stabilization and body support, in the position of Fowler, semi-Fowler and orthostatic.

Several clinical factors are associated with the development of UP. It is highlighted that the nutritional status of patients with UP is often related to the development and progression of UP. Variables such as diameter and depth are considered for a proper evaluation of correlation with the concomitant and nutritional status of the affected subjects. Wound healing is a complex process, well regulated, which consists of three distinct phases (inflammatory phase, proliferative phase and reparative phase). At each stage of wound healing the macronutrients are needed. In addition, animal studies have established a specific role for some nutrients, such as arginine, vitamins A, B, and C and the elements selenium, manganese, zinc and copper.35-36

Nutritional parameters have been correlated with the development and healing of chronic UPs, leading to suggestions that the improvement of nutritional status can prevent or treat UP. In a study whose objective was to evaluate the effectiveness of the Racol® formula for 12 weeks, the analysis indicated notable reductions in the size of the UP and the rates of improvement of waist circumference and cutaneous fold supra-iliac in the intervention group. Covariance structure analysis showed that nutritional intervention has a direct effect on reducing the size of the ulcer. The results suggest that aggressive nutritional intervention accelerated the pressure ulcer healing process of the wound and had a direct effect on reducing the size of the ulcer (p < 0.001).37

Samples collected from exudate of UPs revealed five species of microorganisms (table 1).
Table 1. Microorganisms prevalent in pressure ulcers to patients with traumatic spinal medullar injury, 2010.

<table>
<thead>
<tr>
<th>Identified microorganisms</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staphylococcus aureus</td>
<td>17</td>
<td>85</td>
</tr>
<tr>
<td>Staphylococcus epidermidis</td>
<td>16</td>
<td>80</td>
</tr>
<tr>
<td>Staphylococcus saprophyticus</td>
<td>13</td>
<td>65</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>12</td>
<td>60</td>
</tr>
<tr>
<td>Enterobacter spp.</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>Proteus spp.</td>
<td>9</td>
<td>45</td>
</tr>
</tbody>
</table>

Staphylococcus aureus was identified in 85% of patients with infected skin ulcerations, thus corroborating findings of other research. The microorganism is prevalent in UP and can be identified on the skin of healthy individuals (40%). Coagulase-negative are colonizers of skin microbiota and recognized as causative agents of hospital acquired infections. The microorganism is prevalent in UP and can be identified on the skin of healthy individuals (40%). Coagulase-negative are colonizers of skin microbiota and recognized as causative agents of hospital acquired infections.

High frequency of S. aureus, Pseudomonas aeruginosa and enterobacteria was detected in similar injuries by scholars in the field. Other studies have recorded the presence of Staphylococcus aureus, Streptococcus sp, P. mirabilis, E. coli, P. aeruginosa, Klebsiella sp, and anaerobes like B. fragilis in UP, warning that these microorganisms prevail in pressure ulcers.

A sample of 145 patients with UP to level II presented colonization and/or infection by S. aureus (20.7%) and Gram-negative bacilli (32.5%). Among these microorganisms, 64.8% showed multidrug resistance to instituted antibiotics. Findings like these take on character of alert to bearers of SCI and UP, about the use of antibiotics.

Results of the same study showed cases of bacteremia in 56 patients (50.5%), being a likely microbial source ulcers in 53.6% of the episodes. Thus, it is suggested to rigour in prevention of UPs, because these constitute an important means of microbial resistance, exposing patients to potential risk of bacteremia.

The presence of Escheria coli and Staphylococcus saprophyticus draws attention, for 67% of the patients showed UP in the coccygeal, favouring the colonization of bacterial species, commonly associated with urinary tract infections, complication usually found in patients with injury spinal medullar.

The Staphylococcus epidermidis, in the study, was prevalent in 80% of the sample, causing part of the endogenous microbiota. The microorganism is considered a living skin eater and mucous membranes, causing hospital-acquired infections through catheters, probes and prostheses.

The use of probes for patients with spinal cord injury below T12, eventually in the lumbar region, sacral and coccygeal observed in 60% (n = 12) of the study sample, typically occurs due to episodes of urinary retention, frequent in this interlocutory appeal group of individuals. After spinal cord injury, the muscles lose their ability to bladder contractility and this causes large amount of urine to be retained inside the bladder by muscle flaccidity, being necessary the use of vesical probe.
CONCLUSION

The presence of *E. coli* and *Enterobacter spp.* in the sample in question, is corroborated by a study that claims that the frequency of ulcer patients colonized was elevated (67%), and 80% of these patients presented colonization by *S. aureus* and 67% for Gram-negative bacilli: *E. coli* (15.8%), *Enterobacter spp.* (15.8%) and *Pseudomonas spp.* (26.3%) [38].

The objective of this study was to determine the prevalence of microorganisms in UPS Medullary injury. The results demonstrated in the survey are indicative of relevance for programmes for the prevention and control of infection through an active epidemiological monitoring challenges of microbial resistance and outpatient hospital.

An appropriate microbiological investigation should be instituted in antibiotic therapy protocols of the UPS of injured spinal cord patients, since the identification and determination of bacterial profile direct reduction of microbial resistance and lead to therapeutic success. Studies like this will provide inputs for future investigations to improve clinical practice.

This work contributes to boost the need to seek new methods of identifying microorganisms in UPS, because the use of molecular techniques for typing of these pathogens can expand the possibilities of classification, identification and diagnosis. Phenotypic methods (microscopic, physiological and biological analysis) and genotypic (polymorphisms at the level of the nucleic acids or allelic variation at the level of enzymes) can be used as supplementary analysis to biochemical tests.

The results as of this study should be reported to the multidisciplinary team, will assist in health education and individualized and intensive care of patients, moreover, need to be discussed factors that can influence the evolution of colonization and infection of microorganisms in UPS in patients injured spinal cord. Microbiological investigations are necessary to assess prospective the prevalence of pathogens and as much as to establish interdisciplinary committees aimed at developing educational programs, nutritional and therapeutic. These measures are essential for the reduction of Bacterial colonization and infection, as well as to improve the outcomes and results handled by healthcare professionals.
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