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RESEARCH

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RISK FACTORS FOR PRESSURE INJURY IN PATIENTS WITH COVID-19 IN INTENSIVE CARE UNIT

Fatores de Risco para Lesão Por Pressão em Pacientes com COVID-19 em unidade de terapia intensiva
Factores de riesgo de lesión por presión en pacientes con COVID-19 en unidad de cuidados intensivos

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ABSTRACT

Objective: to identify and discuss risk factors related to the occurrence of pressure injuries in patients with COVID-19 in the Intensive Care Unit. **Method:** descriptive study with a quantitative and retrospective approach that analyzed electronic medical records of a Military Hospital, from April to December 2020. **Results:** 44 (55%) patients participated in the study with a mean age of 68.73 years and a predominance of males (35%). The sacral region (32%) was the most affected, followed by the sacral and calcaneal regions (20%) and stage 2 (31.8%) was the most frequent. The risk factors were: length of stay, use of mechanical ventilation, pronation, use of vasoactive drugs and continuous sedatives, antibiotic therapy, permanence of enteral diet and/or zero diet. **Conclusion:** the implementation of strategies to prevent pressure injuries is extremely important, as it is one of the international goals of patient safety.

DESCRIPTORS: COVID-19; Pressure ulcer; Risk factors; Intensive care units.

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RESUMO

Objetivo: identificar e discutir os fatores de risco relacionados à ocorrência de lesão por pressão em pacientes com COVID-19 em Unidade de Terapia Intensiva. **Método:** estudo descritivo de abordagem quantitativa e retrospectiva que analisou prontuários eletrônicos de um Hospital Militar, no período de abril a dezembro de 2020. **Resultados:** participaram do estudo 44 (55%) pacientes com idade média de 68,73 anos e predominância do gênero masculino (35%). A região sacra (32%) foi a mais acometida, seguida concomitantemente das regiões sacra e calcâneo (20%) e o estágio 2 (31,8%) se mostrou mais frequente. Observou-se como fatores de risco o tempo de internação, o uso de ventilação mecânica, a pronação, o uso de drogas vasoativas e sedativos contínuos, a antibioticoterapia, a permanência de dieta enteral e/ou dieta zero. **Conclusão:** a implementação de estratégias para prevenção de lesão por pressão é de extrema importância, pois é uma das metas internacionais de segurança do paciente.

DESCRIPTORIOS: COVID-19; Lesão por pressão; Fatores de risco; Unidades de terapia intensiva.

RESUMEN

Objetivo: identificar y discutir los factores de riesgo relacionados con la ocurrencia de lesiones por presión en pacientes con COVID-19 en la Unidad de Cuidados Intensivos. **Método:** estudio descriptivo con enfoque cuantitativo y retrospectivo que analizó historias clínicas electrónicas de un Hospital Militar, de abril a diciembre de 2020. **Resultados:** Participaron en el estudio 44 (55%) pacientes con una edad media de 68,73 años y predominio del sexo masculino (35%). La región sacra (32%) fue la más afectada, seguida de la región sacra y calcánea (20%) y el estadio 2 (31,8%) fue el más frecuente. Los factores de riesgo fueron: estancia hospitalaria, uso de ventilación mecánica, pronación, uso de fármacos vasoactivos y sedantes continuos, antibioticoterapia, permanencia de dieta enteral y/o dieta cero. **Conclusión:** la implementación de estrategias para la prevención de las lesiones por presión es de suma importancia, ya que es una de las metas internacionales de seguridad del paciente.

DESCRIPTORIOS: COVID-19; Úlcera por presión; Factores de riesgo; Unidades de cuidados intensivos.

INTRODUCTION

In December 2019, an outbreak of pneumonia with unknown cause occurred in the city of Wuhan, China. After a series of studies, coronavirus, the disease determinant COVID-19, was identified as the causative agent, with great potential for community and hospital transmission due to its rapid spread and difficulty of containment. Spread occurs through contact with respiratory droplets of contaminated people.¹⁻²

The virus is associated with the occurrence of upper respiratory tract infection with flu-like symptoms such as fever, cough, dyspnea, myalgia, fatigue, and gastrointestinal complaints. Patients may develop severe acute respiratory syndrome - SARS, requiring oxygen therapy and transfer to the Intensive Care Unit - ICU due to the clinical severity and hemodynamic instability of the organic systems.¹⁻²

SARS generates conditions that require life support mechanisms such as monitoring, orotracheal intubation, continuous administration of vasoactive drugs, corticoids, antibiotics and sedatives, and the use of invasive devices such as catheters, drains and probes. However, these conditions make patients susceptible to alterations in skin integrity that may contribute to the appearance of PUs.²⁻³

PUs are injuries that compromise the skin and/or tissue, occurring most frequently at bony prominence points due to prolonged pressure exerted by immobilization or shear, and may also be related to medical devices. The critically ill patient is susceptible to developing PU due to some intrinsic and extrinsic risk factors.³

During ICU stay, the patient with COVID-19 has reduced blood pressure resulting from cardiovascular alterations, systemic inflammatory response syndrome, septic shock and/or hemorrhagic shock compromising oxygen perfusion and causing tissue necrosis. Moreover, the use of prone position, which has been successful in treating respiratory failure, may contribute to the development of injuries due to the impossibility of changing the position every two hours to relieve local pressure.³⁻⁴

The LP is an adverse event in care, i.e., an incident that results in harm to the patient, the family members, and the entire healthcare system, because it causes a prolonged hospital stay, increased spending on materials, special dressings and bandages, and the appearance of infection and other preventable conditions, or even death.³⁻⁴

The prevention and reduction of risks of LP are possible through preventive measures adopted mainly by the nursing team, because it is more present in relation to care. The nurse is the main responsible for implementing strategies for LP prevention in inpatient units.⁵

Considering all the risk factors that influence the onset of GP in patients with SARS, early intervention is necessary to avoid this complication. Thus, the objectives of this study were to identify and discuss the risk factors related to the occurrence of PU in patients with COVID-19 in an Intensive Care Unit.

METHOD

This is a descriptive study with a quantitative and retrospective approach, developed in an Intensive Care Unit intended

for admission of patients positive with COVID-19 in a Military Hospital, located in the city of Rio de Janeiro.

The study participants were patients admitted to the ICU from April to December 2020. The inclusion criterion was the medical records of patients who presented LP during hospitalization. And as exclusion criteria, the charts of patients who presented LPP prior to admission and who remained in the unit for less than 72 hours.

Data collection was performed through electronic medical records, using a data collection instrument containing demographic and clinical variables, such as gender, skin color, age, comorbidities, Braden Scale, RASS Scale, ICU stay (days), use of continuous sedation (days) use of mechanical ventilation (days), use of antibiotics (days), use of vasoactive drugs (days), use of enteral diet (days), zero diet (days), prone position, presence of LP, as well as its location and classification, and the final outcome (death and hospital discharge).

Data were grouped in the Microsoft Office Excel 2010 software program. Then, descriptive analysis was performed in R Software and statistical synthesis with calculation of incidence and prevalence of LP. Discrete and continuous variables were presented with measures of position and dispersion (mean, median, standard deviation); categorical variables were compared with Pearson's Chi-square using a 5% significance level.

The study was approved by the Ethics Committee under approval number CAAE 46574021.0.3001.5256.

RESULTS

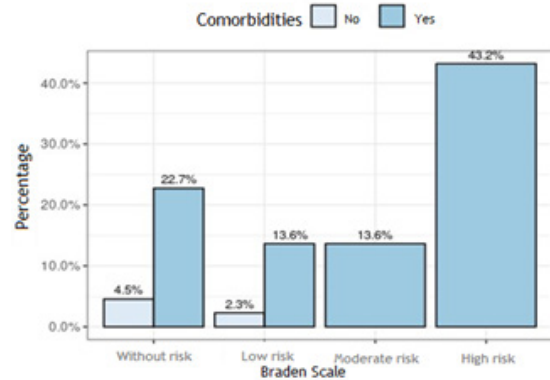
Of the 80 patients admitted to the ICU, 44 (55%) developed LP during hospitalization. These patients had a mean age of 68.73 years. Table 1 shows the variable age with the minimum and maximum measurements of the research participants.

Among the demographic variables, male gender (35%) and white race/color (10%) predominated, 35% of the medical records did not contain information on the variable race/color. As for the clinical variables, it was found that of the 44 medical records evaluated, three (6.82%) did not have any type of pre-existing comorbidity.

When applying the chi-square test a p-value of 0% was obtained, i.e., lower than the 5% significance level, and therefore, the hypothesis of independence between the comorbidity and PU variables was rejected. Thus, there is evidence that a relationship exists between these two variables.

As for application of the Braden Scale at admission, it indicated high risk for developing LP in 43.2% (n=19) of the medical charts evaluated, 13.6% (n=6) presented moderate risk, 15.9%

Figure 1 – Clinical variables (Comorbidity and LP) of patients admitted to the ICU. Rio de Janeiro, RJ, Brazil, 2021



Source: Prepared by the authors, July, 2021.

(n=7) low risk and 27.2% (n=12) no risk. Graph 1 reiterates the relationship between comorbidity and LP.

About the length of stay in ICU, 66% of the medical charts stayed for more than 20 days, 27% from 10 to 20 days and 7% for less than 10 days. Based on the study data, it can be stated that 100% (n=44) of the analyzed medical charts found the use of mechanical ventilation, continuous sedation, antibiotics, vasoactive drugs, enteral diet and zero diet during some period of hospitalization. Table 2 shows the measures derived from the variables analyzed.

Regarding the frequency distribution in each clinical variable it was observed that 14 patients stayed from 21 to 30 days in the ICU, 16 prolonged from 11 to 20 days on mechanical ventilation, 15 stayed from 11 to 20 days on continuous sedation, 17 patients had from 11 to 20 days on antibiotic therapy, 19 from one to 10 days on vasoactive drugs, 17 patients stayed from six to 10 days on zero diet and 12 from one to 10 days on enteral diet.

It was found that 45.5% of the patients were pronated and 54.5% did not use this position. Besides, 90.9% (n=40) were classified “-5 not awake” in the RASS scale.

Regarding the presence of LP, 59.1% (n=26) developed one lesion, 34.1% (n=15) two lesions, 4.5% (n=2) four lesions, and 2.3% (n=1) seven lesions. Regarding location, the sacrum (32%) was the most affected region, followed concomitantly by the sacral and calcaneal regions (20%) as illustrated in Table 3. In the classification, the most frequent staging was stage 2 (31.8%). The second highest frequency, 11.4%, is of patients who presented at least two lesions whose classifications are stage 2 and unclassifiable.

As for the process of hospital discharge or death, it was found that the presence of LP did not influence these outcomes. For, by means of the chi-square test, a p-value of 93% was calculated. This value is higher than the significance level of 5% and thus does not reject the hypothesis of independence between the two variables.

Table 1 – Descriptive analysis of the age of patients admitted to the ICU. Rio de Janeiro, RJ, Brazil, 2021

Variable	Minimum	Maximum	1st Quartile	Median	3rd Quartile	Average	Standard deviation
Idade	35	96	61,75	68,5	76	68,73	11,5

Source: Prepared by the authors, July, 2021.

Table 2 – Analysis of the clinical variables of patients admitted to the ICU. Rio de Janeiro, RJ, Brazil, 2021

Variables	Minimum	Maximum	1st Quartile	Median	3rd Quartile	Average	Standard deviation
ICU time (in days)	4	71	15	26	34,25	27,14	14,35
Mechanical ventilation (in days)	2	71	15	24	31,5	25,16	14,43
Continuous sedation (in days)	2	58	15	24	29,25	23	11,86
Antibiotic (in days)	4	67	11,75	17	26	20,55	12,5
Vasoactive drugs (in days)	2	58	7,75	12	25	16,32	11,73
Zero diet (in days)	2	22	4,75	7	11,25	8,55	5,58
Enteral diet (in days)	0	54	5,75	19	26,5	18,55	13,24

Source: Prepared by the authors, July, 2021.

Table 3 – Location and quantity of LP in the ICU. Rio de Janeiro, RJ, Brazil, 2021

LP Location	Number of patients with LP	Percentage
Heel	2	5%
Back	1	2%
Scapula and Intergluteal	1	2%
Interglúteo	2	5%
Intergluteal and auricular pavilion/MSD/ bilateral thigh/ lateral aspect of bilateral tibia/	1	2%
Occipital and Calcaneus	1	2%
Occipital and Intergluteal	1	2%
Occipital, Calcaneal and Dorsal	1	2%
Occipital, Sacral and Calcaneal	1	2%
Occipital, Sacral, Tibia and Calcaneus	1	2%
Sacra	14	32%
Sacra and Calcaneus	9	20%
Sacred and Back	1	2%
Sacral and Intergluteal	4	9%
Sacra and upper lip/ Bilateral tibia	1	2%
Sacra and auricular pavilion	1	2%
Sacra and auricular Pavillion MSD index finger	1	2%
Sacra, Calcaneus and Calf	1	2%
Grand total	44	100%

Source: Prepared by the authors, July, 2021.

DISCUSSION

It was observed in this study that the elderly, a risk group for COVID-19, are more susceptible to infections and to the development of LP due to changes in the aging process. As far as the skin is concerned, significant changes, such as the reduction of natural hydration and collagen synthesis, make the tissues more rigid, contributing to the limitation of pressure distribution and impaired local circulation.⁶⁻⁷

The involvement by LP in males agrees with the findings of another research conducted in an ICU, where females prevailed. It is believed that the incidence occurred because males were more affected by COVID-19, corroborating the data from the Special Epidemiological Bulletin (Coronavirus Disease COVID-19). The real reason for such involvement is not yet defined and may be related to behavioral factors and lifestyle.²⁻⁸

Regarding race/color, the data generated was inconclusive, since 35% of the medical records did not have this information, followed by the prevalent white color (10%). However, it was

noted in previous publications that this variable does not appear as a risk factor associated with LP.³⁻⁹⁻¹⁰

The prevalence of patients with pre-existing comorbidities such as diabetes mellitus and hypertension corroborated the development of LP. Studies point out that hyperglycemia, characterized by an intrinsic factor, has a deleterious effect on wound healing and on the formation of advanced glycation end products - AGEs that induce the production of inflammatory molecules - TNF- α and IL-1 and interfere in collagen synthesis, besides causing thickening of the basement membrane of capillaries and arterioles. Furthermore, systemic arterial hypertension alters the defense cutaneous circulation of the affected site, making the skin more prone to the appearance of wounds.¹¹

Another important factor is the Braden Scale, when performed at the time of admission, it determines the risk of LP of patients, making it possible that actions are taken to prevent and/or reduce the development of injuries. It is important to emphasize that it should be reapplied daily, allowing the identification of new

risk scores and thus, the reformulation of the therapeutic plan as to skin integrity care.¹²⁻¹³

As for the length of hospital stay, it was considered an important risk agent for the appearance of LP, because 66% of patients remained hospitalized for 20 days or more. According to the Programa de Apoio ao Desenvolvimento Institucional do Sistema Único de Saúde - PROADI-SUS, the mean length of hospital stay for treatment of COVID-19 in public and private ICUs in Brazil was 11.6 days. Another study shows that prolonged bed rest increases the risk of LP due to decreased mobility and constant pressure on bony prominence points.¹⁴⁻¹⁵

The ICU is the place of admission that deserves more attention related to LP prevention because of the clinical severity of the patients. They usually require the use of mechanical ventilation - MV and sedatives that favor immobilization, making patients totally dependent on the healthcare team. In addition, they become vulnerable to alterations in the process of skin maintenance and integrity, favoring the development of LP.⁸⁻⁹

The use of sedation is used to improve comfort and pain, consequently, its continuous administration prolongs ICU stay and MV use, risk factors for LP. In order to minimize this time it is indicated to perform daily awakenings tests and spontaneous breathing in combination with the use of short-acting sedatives. According to the Brazilian Intensive Care Medicine Association, patients with SARS or in need of pronation must be deeply sedated for therapeutic improvement, being evaluated daily using the Richmond Agitation and sedation scale - RASS.¹⁶⁻¹⁷

In the present study it was possible to observe that 90.9% of the patients evaluated by the RASS Scale presented a score of -5, which indicates that the patient does not present an ocular, motor or verbal response when stimulated verbally or physically. This fact makes the patient more vulnerable to develop LP due to reduced sensory capacities.

The research data show that patients in the ICU used antibiotics during their stay, with an average of 20.55 days. In this therapeutic form diarrhea is common and, as a consequence, the presence of irritant agents that increase permeability and pH, causing damage to the epidermis and the appearance of dermatitis associated with incontinence, which compromises the skin protection barrier in response to chronic exposure to moisture, and when treated inadvertently may evolve to LP.¹⁸

As to nutritional aspects, there was significance in the state of hypercatabolism due to interventions to which critically ill patients are submitted, such as several days of enteral diet and/or zero diet, characterizing an inadequate nutritional supply that contributes to the appearance and hinders the lesions healing process.¹⁹

The prone position, a relevant factor in the study, is an adjuvant measure in the treatment to improve lung compliance, favoring tissue oxygenation. However, it subjects the patient to many hours in ventral decubitus, increasing the local pressure and humidity, making the development of LP possible. To prevent injuries, it is recommended to change the position of the head and limbs and use pads, but even if preventive measures are used, damage

may occur. However, studies state that in order to avoid them, it is necessary to thoroughly inspect the skin before pronation. And when pronating, make sure that there are no devices such as probes, catheters, and electrodes pressing on the skin tissue.²⁰⁻²¹

In this context, health professionals working in intensive care need safety and training to perform the technique effectively, correctly positioning the pads and preventive dressings in places with greater vulnerability such as forehead, pinna, nose, chin, shoulders, pelvis, genitalia, knees and toes.²²

It was observed that LP prevention is directly related to nursing, a category that provides from simple to more complex care. Professionals should be trained to assess the patient's conditions, identify risk factors, develop and implement standards and routines for LP prevention and treatment procedures. Measures such as changing the decubitus every two hours, skin hydration, bone prominence protection, and hygiene will minimize the occurrence of this adverse event; however, the team needs training and awareness to provide harm-free care.²³

As for the occurrence of LP, the most affected areas were the sacrum and calcaneus, converging with a study carried out with critically ill patients where they were also identified as the regions with the highest incidence. As these are sites of bony prominences in continuous pressure with another surface or shear, they favor the appearance of lesions. It should be added that remaining in dorsal decubitus associated with clinical conditions, such as COVID-19, and hemodynamic instability may cause tissue hypoxia, however, repositioning should be performed respecting the patient's clinical status.^{7,24-25}

According to the National Pressure Ulcer Advisory Panel - NPUAP, LP are classified into four stages, in addition to those considered unclassifiable, deep tissue injuries and injuries caused by medical devices. Stage 2 LP, the most identified in the study, involves the loss of partial thickness of the skin with exposure of the dermis. The wound bed is viable, pink or red in color, moist, and may present as an intact or broken flitena. Moreover, in the unclassifiable pressure injury, considered another research finding, there is full thickness skin loss with tissue loss, but the extent of the damage cannot be confirmed because it is covered by liquefaction necrosis (sphacelo) and or coagulation necrosis (eschar).²⁶

The LP is considered an adverse event in care, resulting in damage to the patient and the health system, in addition to generating inevitable injuries.⁵ Regarding the process of hospital discharge or death, it was found that the presence of LP did not influence these outcomes.

CONCLUSION

It was found during the research that the management of the patient with COVID-19 is peculiar and complex. Factors such as length of stay, use of mechanical ventilation, pronation, use of vasoactive and sedative drugs, antibiotic therapy, enteral diet and/or zero diet plus clinical and hemodynamic instability are risk factors for the development of PU.

The participation of the healthcare team aiming at the implementation of strategies for PU prevention is extremely important, as it is one of the international patient safety goals.

It is noteworthy that during the research some limitations occurred, such as incomplete data in the electronic medical record, a significant number of deaths within 72 hours of hospitalization, and the closing of the ICU due to a decrease in the number of cases of COVID-19, which influenced the period that encompassed data collection. Therefore, it is intended to continue the study in order to correct the possible biases and to analyze in a more accurate way the theme in question.

Thus, it is suggested that further research be carried out in order to contribute to quality and efficient care. Also, to identify improvements in the management of critical patients susceptible to the development of LP, based on the knowledge of predictive factors and implementation of the actions proposed in this study.

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