

## INCONTINENCE-ASSOCIATED DERMATITIS: PREVALENCE AND ASSOCIATED FACTORS IN INTENSIVE CARE UNIT

Beatriz Wiltenburg Domingues<sup>1,\*</sup> , Taís Milena Pantaleão de Souza<sup>2</sup> , Laís Del Moro Cespedes Wojastyk<sup>2</sup> , Vera Lucia Conceição de Gouveia Santos<sup>3</sup> , Paula Cristina Nogueira<sup>3</sup> 

### ABSTRACT

**Objective:** To analyze the point prevalence of incontinence-associated dermatitis (IAD) and associated factors in adult patients admitted to Intensive Care Units (ICUs). **Method:** A cross-sectional, observational, retrospective study carried out with 105 patients in the ICU of three university hospitals located in the state of São Paulo. The demographic and clinical variables and IAD come from the database of the research project “Prevalence of pressure injuries in the Intensive Care Unit,” composed of information from medical records and physical examination. Data were analyzed using descriptive and inferential statistics. The study was approved by the Research Ethics Committee of the proposing institution. **Results:** Of the 105 patients, 58 (55.24%) were male, with a mean age of 55.76 years (SD = 16.39), 105 (91.3%) had a urinary catheter and 89.4% wore diapers. Ten patients had IAD, with a point prevalence of 9.52%. The factor associated with IAD was admission due to trauma ( $p = 0.02$ ). **Conclusion:** Studies on IAD are essential for quality, well-structured and grounded nursing care, especially in the care of critically ill patients.

**DESCRIPTORS:** Dermatitis. Prevalence. Fecal incontinence. Urinary incontinence. Enterostomal therapy. Intensive care units.

## DERMATITE ASSOCIADA À INCONTINÊNCIA: PREVALÊNCIA E FATORES ASSOCIADOS EM UNIDADE DE TERAPIA INTENSIVA

### RESUMO

**Objetivo:** Analisar a prevalência pontual de dermatite associada à incontinência (DAI) e os fatores associados em pacientes adultos internados em unidades de terapia intensiva (UTIs). **Método:** Estudo transversal, observacional, retrospectivo, realizado com 105 pacientes em UTI de três hospitais universitários localizados no estado de São Paulo. As variáveis demográficas, clínicas e de DAI foram coletadas do banco de dados do projeto de pesquisa “Prevalência de lesão por pressão em Unidade de Terapia Intensiva”, composto por informações extraídas dos prontuários e de exames físicos. Os dados foram analisados por meio de estatística descritiva e inferencial. O estudo foi aprovado pelo Comitê de Ética em Pesquisa da Instituição proponente. **Resultados:** Dos 105 pacientes, 58 (55,2%) eram do sexo masculino, com média de idade de 55,76 anos (desvio padrão = 16,4), 105 (91,3%)

1. Universidade de São Paulo – Escola de Enfermagem – Programa de Residência em Enfermagem na Saúde do Adulto e do Idoso – São Paulo (SP), Brazil.
2. Universidade de São Paulo – Escola de Enfermagem – Programa de Pós-Graduação em Enfermagem na Saúde do Adulto – São Paulo (SP), Brazil.
3. Universidade de São Paulo – Escola de Enfermagem – Departamento de Enfermagem Médico-Cirúrgica – São Paulo (SP), Brazil.

\*Correspondence author: [beatriz.wiltenburg.domingues@usp.br](mailto:beatriz.wiltenburg.domingues@usp.br)

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estavam com cateter urinário e 89,4% usavam fraldas. Dez pacientes apresentaram DAI, com prevalência pontual de 9,5%. O fator associado à DAI foi a admissão por trauma ( $p = 0,02$ ). **Conclusão:** Estudos sobre DAI são fundamentais para uma assistência de enfermagem de qualidade, bem estruturada e fundamentada, sobretudo no cuidado aos pacientes críticos.

**DESCRITORES:** Dermatite. Prevalência. Incontinência fecal. Incontinência urinária. Estomaterapia. Unidades de terapia intensiva.

## DERMATITIS ASOCIADA CON INCONTINENCIA: PREVALENCIA Y FACTORES ASOCIADOS EN UNIDADES DE CUIDADOS INTENSIVOS

### RESUMEN

**Objetivo:** Analizar la prevalencia puntual de Dermatitis Asociada a Incontinencia (DAI) y factores asociados en pacientes adultos ingresados en Unidades de Cuidados Intensivos (UCI). **Método:** estudio transversal, observacional, retrospectivo, realizado con 105 pacientes en la UTI de tres hospitales universitarios ubicados en São Paulo. Las variables demográficas, clínicas y DAI provienen de la base de datos del proyecto de investigación "Prevalencia de lesiones por presión en la Unidad de Cuidados Intensivos", compuesta por información de historias clínicas y exámenes físicos. Los datos se analizaron mediante estadística descriptiva e inferencial. El estudio fue aprobado por el Comité de Ética en Investigación de la institución proponente. **Resultados:** de los 105 pacientes, 58 (55,24%) eran del sexo masculino, con una edad media de 55,76 años ( $DE = 16,39$ ), 105 (91,3%) tenían sonda vesical y 89,4% usaban pañales. Diez pacientes tenían DAI, con una prevalencia puntual del 9,52%. El factor asociado a la DAI fue el ingreso por traumatismo ( $p = 0,02$ ). **Conclusión:** los estudios sobre la DAI son esenciales para una atención de enfermería de calidad, bien estructurada y fundamentada, especialmente en el cuidado de pacientes críticos.

**DESCRIPTORES:** Dermatitis. Prevalencia. Incontinencia fecal. Incontinencia urinaria. Estomaterapia. Unidades de cuidados intensivos.

## INTRODUCTION

Incontinence-associated dermatitis (IAD) depicts the skin damage associated with exposure to urine, feces or a combination of these effluents, and is characterized as a clinical manifestation consisting of irritation and subsequent inflammation of the skin due to contact of the perineal, perigenital, perianal and surrounding skin with moisture from bladder and bowel movements, being more common in patients with urinary and/or fecal incontinence and may be present in people of different ages<sup>1</sup>.

This lesion is the most common among moisture-associated skin lesions, known as moisture-associated skin damage (MASD) and evolves from a combination of factors, such as excessive moisture caused by urinary and/or fecal incontinence, change in skin pH, friction, shear, and colonization by microorganisms. It causes pain, burning, itching, discomfort and, consequently, a decrease in the quality of life of affected patients<sup>1-3</sup>. In addition, it can act as an entry point for infections such as urinary tract and skin infections, and has been strongly linked as a risk factor for the development of pressure ulcers (PUs)<sup>2,3</sup>. IAD is characterized as an irritant dermatitis that manifests clinically with the presence of erythema and edema of the skin and may be accompanied by blisters with serous exudates and evolve with erosion and/or secondary infection of the skin<sup>2-4</sup>.

This type of injury is pointed out in the literature as one of the most prevalent and incidentals in critically ill patients. This is due to the profile of these patients, who often have physical limitations, decreased mobility and sensory sensitivity, as well as lowered level of consciousness, and often have urinary incontinence, fecal incontinence or both, requiring the use of devices to control them, highlighting the relevant frequency on the use of absorbent diapers that further intensify its occurrence as a result of prolonged skin contact with urine and feces and the heat caused by the diaper that smothers

the affected region<sup>3,4</sup>. These aspects represent numerous risk factors for the development of skin lesions, since they are related to the etiology of most of them and favor tissue damage, thus, the skin of critically ill patients hospitalized in intensive care units (ICUs) becomes even more vulnerable to skin lesions, among them IAD, which has a complex and multifactorial etiology<sup>5</sup>.

The prevalence of IAD varies greatly according to the study and country investigated, which can be justified by the study method employed, as well as by the health policies and prevention measures instituted in each locality. A study conducted in 2017, in an ICU of a large private hospital in São Paulo, obtained a prevalence of IAD of 40.9%<sup>6</sup>; while another study, conducted in a university hospital in Mato Grosso do Sul in 2019, found a prevalence of 56.2% of IAD in incontinent patients<sup>7</sup>. In the international context, a research developed in four hospitals in Norway found a prevalence of 7.6%, and, from the total of evaluated patients, 16.5% were incontinent<sup>8</sup>. Another study, which evaluated ICU patients in 36 US states, found an overall prevalence of 21.3% of IAD, with 46.6% of patients being incontinent<sup>9</sup>.

Among the risk factors related to AID in the ICU, evidenced in the national and international literature, are: extreme age, use of invasive devices, diarrhea, limited mobility and bed rest, inability to perform their own hygiene, fever, infection, decreased tissue perfusion caused by hemodynamic instability, use of vasoactive drugs and antibiotics, impaired sensitivity due to decreased consciousness, friction and shear, skin moisture, and nutritional status deficit<sup>4</sup>.

Therefore, it is worth remembering that skin lesions represent a sensitive indicator of the quality of care provided to patients and, therefore, are extremely important in clinical practice, and should be early identified, prevented and/or treated based on well-supported scientific evidence for the effectiveness of quality care, which is currently a challenge for nursing in routine care<sup>4</sup>.

An experimental study that conducted online training with an approach on prevention, early detection and skin care protocol with critical care nurses showed in its results a 50% reduction in the appearance of MASD<sup>10</sup>. However, there are still many difficulties in the management of AID, as studies show that health professionals confuse it with PU in its early stages<sup>4,6</sup>, besides the need for more epidemiological studies on the subject and that give rise to stronger recommendations for its prevention<sup>11</sup>.

The relevance of this study consists in the fact that nursing actions aimed at the prevention, early detection, and treatment of IAD are fundamental for a quality care that offers more comfort, well-being, and scientifically well-founded care to the patient, besides avoiding complications, reducing hospitalization time, reducing costs, and shortening the physical and psychological stress caused to the patient. Thus, the importance of the subject being further explored and studied is evident, in order to contribute to the construction of a broader and deeper knowledge about the epidemiology of IAD and its associated factors in ICUs.

The aim of this study was to analyze the point prevalence of IAD and the demographic and clinical factors associated with the occurrence of this injury in adult ICU patients.

## METHODS

This is a documental, cross-sectional, observational, epidemiological study of the point prevalence of IAD and its associated factors, in ICUs of different specialties of three public and large university hospitals located in the cities of São Paulo and Campinas, state of São Paulo. The study population consisted of all patients admitted to the ICUs of the three hospitals, totaling 105 patients.

This study was conducted using the database from the research project entitled "Prevalence of PUs in Intensive Care Units," which is a multicenter research project, part of an international project, approved by the Research Ethics Committees of the proposing institution, co-participants, and by the National Research Ethics Committee (CAAE: 82211318.7.0000.5392).

To conduct the present study, therefore, information was collected from the database of the aforementioned research, and the demographic, clinical, and IAD variables of the 105 patients were selected, composing a new database. The variables

collected were: demographic (gender and age), clinical (weight and height for later calculation of body mass index (BMI), length of stay, Braden scale score, medical diagnosis, type of admission, comorbidities, presence of incontinence, presence of PU, use of vasopressors, use of invasive mechanical ventilation, renal replacement therapy, use of devices (urinary, fecal, diapers) and data on the presence or absence of IAD. For the larger research project, the demographic and clinical data that comprise the database were collected from the patients' medical records, and the data regarding skin lesions were collected through physical examination. It is emphasized that no instrument was used to classify the IADs because at the time there was no classification instrument adapted and validated for the Portuguese language of Brazil. Data collection took place between the period September to November 2020.

After this step, the final data were transferred to a Microsoft Excel spreadsheet and statistically analyzed using the R 3.6.0 statistical program. For the analyses, descriptive statistics were used, using mean and standard deviation (SD) for continuous variables and absolute and relative frequencies for categorical variables. To verify the association between the dependent variable (presence of IAD) and the other variables, the analyses were performed using Person's chi-square statistical test and Fisher's exact test for the categorical variables, and Student's t-test and Wilcoxon–Mann–Whitney test for the numerical variables, according to the data distribution of each variable in question. For these analyses a 5% significance level was adopted ( $p \leq 0.05$ ).

The point prevalence of IAD was calculated by considering the number of patients with IAD included in the study in relation to the total number of patients evaluated in each period, which in this study consisted of one day (Eq. 1):

$$\text{Point Prevalence} = \frac{\text{No. of patients with IAD}}{\text{No. of patients evaluated}} \times 100 \quad (1)$$

The point prevalence calculation was performed as recommended by the National Pressure Ulcer Advisory Panel (NPUAP), European Pressure Ulcer Advisory Panel (EPUAP) and the Pan Pacific Pressure Injury Alliance (PPPIA)<sup>12</sup>.

In this study, we used the checklist of items that should be included in cross-sectional studies: STROBE Statement<sup>13</sup>, which was evaluated and approved by the Research Ethics Committee under opinion no. 3,723,950, CAAE: 24486719.1.0000.5392.

## RESULTS

The total study sample consisted of 105 patients, 63 (60%) from Institution A, 10 (9.5%) from Institution B, and 32 (30.5%) from Institution C. Institution A has 6 ICUs, which are: emergency, liver transplant, medical, pneumology, surgical, and trauma; Institution B has only one ICU, for medical and surgical specialties, and finally, Institution C, which has 3 ICUs, divided into: cardiology, general practice, and medical and trauma.

Of the 105 patients, the majority, 58 (55.2%) were male, with a mean age of 55.7 years (SD = 16.4), ranging from 18 to 84 years. The average length of stay in the ICU was 23.7 days (SD = 119.9), with surgical and emergency admissions being the most frequent, with 36 (34.3%) patients each.

As for the main medical diagnosis, 21 (20.0%) patients had neurological disorders, followed by cardiac, vascular and pulmonary disorders with 11 (10.5%) patients each. The main comorbidity was diabetes mellitus, present in 36 (34.3%) patients, followed by renal injury, with 25 (23.8%) patients. Among the sample, 39 (37.1%) patients were on mechanical ventilation and 29 (27.6%) were on renal replacement therapy. As for the medications used, 36 (34.3%) patients were on vasopressors and 21 (19.0%) on sedation.

Regarding the presence of incontinence, from the total sample, 8 (7.6%) patients had fecal incontinence, 2 (1.9%) had urinary incontinence, and only 1 (0.95%) had mixed incontinence. It is noteworthy that 105 (91.3%) patients were using a urinary catheter and, in these cases, were classified as urinary continents. Diapers were present in 94 (89.4%) patients in the sample and 2 (1.9%) patients used a rectal catheter.

Of the 105 patients, 10 had IAD, representing a point prevalence of 9.5%. Of the ten patients who presented IAD, 8 came from Institution A, achieving a prevalence of 12.7% (8/63 patients), among which 4 (33.3%) were in the emergency ICU, followed by the trauma ICU, with 3 (25.0%) patients. In Institution C, 2 cases of IAD were identified, which determines a prevalence of 6.2% (2/32 patients). There were no cases of IAD at Institution B on the day of data collection.

Considering the main diagnosis of the patients on the day of collection, 3 (33.3%) of the 10 patients with IAD were victims of trauma, while 2 (16.6%) had some gastrointestinal condition, followed by cardiac, renal, infection, neoplasm, and other diagnoses, with only 1 (14.3%) patient each.

Regarding the presence of PU, 6 (13.6%) of the patients with IAD had some PU. Following the Braden scale classifications, all patients with IAD were bedridden, scoring the minimum value on the *Activity* subscale, along with 2 (28.5%) patients with IAD being classified as constantly moist, also scoring the minimum value on the *Humidity* subscale.

It is noteworthy, regarding incontinence among the total number of patients with IAD, that 2 (25.0%) had fecal incontinence and all 10 patients with IAD were in diapers and 10 of them used a urinary catheter.

Regarding the factors associated with IAD, of the quantitative clinical variables, none of them obtained statistically significant results. In the cases of patients who had IAD, the mean BMI, 29.0 kg/m<sup>2</sup> (SD = 4.2), was higher than in those who did not, 27.6 kg/m<sup>2</sup> (SD = 5.8), but the BMI value was analyzed in only 45 (42.8%) patients of the total sample, due to the absence of record about weight or height in the database and patient records on the day of the study (Table 1).

**Table 1.** Quantitative variables in ICU patients with and without IAD. São Paulo, 2022.

Clinical variables	IAD		p-value
	Yes Average (DP)	No Average (DP)	
Age	46.4 (21.0)	56.7 (15.6)	0.057**
Hospitalization time	13.9 (7.9)	24.7 (126.1)	0.099*
BMI <sup>1</sup>	29.0 (4.2)	27.7 (5.8)	0.754**
Braden	13.4 (3.3)	13.0 (3.7)	0.747**

\* Wilcoxon-Mann-Whitney test; \*\* Student's t-test; 1 Values referring to 45 patients.

As for the qualitative variables, only the type of patient admission presented a statistically significant association with respect to the presence of IAD ( $p = 0.021$ ), highlighting trauma admission. (Table 2).

**Table 2.** Qualitative variables in ICU patients with and without IAD. São Paulo, 2022.

Clinical variables	IAD		Total n (%)	p-value
	Yes n (%)	No n (%)		
<b>Sex</b>				<b>0.311*</b>
Female	6 (12.7)	41 (87.2)	47 (44.7)	
Male	4 (6.9)	54 (93.1)	58 (55.2)	
<b>Medications in use</b>				
Vasopressors	3 (8.3)	33 (91.6)	36 (34.3)	0.765*
Sedatives	0 (0.0)	21 (100.0)	21 (20.0)	0.206**

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Table 2. Continuation...

Clinical variables	IAD		Total n (%)	p-value
	Yes n (%)	No n (%)		
Invasive mechanical ventilation	1 (2.5)	38 (97.4)	39 (37.1)	0.063*
Renal replacement therapy	2 (6.9)	27 (93.1)	29 (27.6)	0.573*
Pressure ulcer	6 (13.6)	38 (86.4)	44 (41.9)	0.225*
<b>Incontinence</b>				
Urinary	0 (0.0)	2 (100.0)	2 (1.9)	1.000**
Fecal	2 (25.0)	6 (75.0)	8 (7.6)	0.168**
Mixed	0 (0.0)	1 (100.0)	1 (0.9)	1.000**
<b>Incontinence control devices</b>				
Diaper	10 (10.6)	84 (89.4)	94 (89.5)	0.594**
Urine collection bag	10 (8.7)	105 (91.3)	115 (109.5)	0.793*
Rectal catheter	0 (0.00)	2 (100.00)	2 (1.9)	1.0008*
<b>Admission type</b>				0.021**
Surgical	4 (11.11)	32 (88.89)	36 (34.2)	
Elective	0 (0.00)	2 (100.00)	2 (1.9)	
Medical	3 (13.64)	19 (86.36)	22 (20.9)	
Trauma	3 (33.33)	6 (66.67)	9 (8.5)	
Urgency	0 (0.00)	36 (100.00)	36 (34.2)	

\* Pearson's chi-square test; \*\* Fisher's exact test.

## DISCUSSION

In this study, the total point prevalence of AID found in the analyzed ICUs was 9.52%, a value below other national studies that obtained prevalence values of AID between 36.2% and 56.2%<sup>6,7,14</sup>. International studies have shown prevalence values of IAD ranging from 1.4% to 21.3%.<sup>8,15-17</sup>

A study conducted in 2019 in the medical clinic of a university hospital in Mato Grosso do Sul, obtained a prevalence of 56.2% of IAD in incontinent patients, demonstrating that IAD is a frequent skin lesion in incontinent patients<sup>6</sup>. In a study conducted in the ICUs of a large private hospital in the city of São Paulo, the point prevalence of IAD was 40.9%.<sup>13</sup>. Another study, carried out in clinical, surgical and long-stay inpatient units of hospitals in the interior of São Paulo, found a prevalence of IAD of 36.2%.<sup>14</sup>

A study conducted in ICU, intensive care, long-term care and rehabilitation facilities in the USA and Canada found a prevalence of 4.3%, and the prevalence in incontinent patients was 18.0%.<sup>16</sup>. In another study, in which electronic databases from China were used, 10 articles were selected and the authors found a prevalence of 1.44% in hospitalized patients<sup>18</sup>.

It is known that almost one in four hospitalized adults suffer from incontinence and that of these, more than 40% have IAD<sup>19</sup>. In this study, incontinence was not a statistically significant factor in relation to IAD; however, 2 (25%) patients with IAD had fecal incontinence and most (91.3%) were using a urinary catheter, not being considered urinary incontinent. Critically ill patients are usually fed and receive medication enterally or parenterally; however, even with institutional



protocols, diarrhea remains a problem in this group of patients, largely due to the nature of the patient's critical illness and altered pathophysiology, in addition to the use of some medications, which can result in intestinal dysbiosis<sup>20</sup>.

In a study conducted in a private tertiary care institution in the city of São Paulo<sup>6</sup>, in addition to enteral nutrition, the type of oxygenation offered to the patient was also associated with IAD, and 2.56% of patients were under invasive mechanical ventilation.

Although the present study has not identified a statistically significant association between the presence of IAD and the use of diapers, it is noteworthy that all patients who presented IAD were also using diapers, which corroborates the results of other studies that have already demonstrated the use of diapers as an important risk factor for the development of IAD<sup>3</sup>. The use of diapers can warm and irritate the perineal region, besides making the site stiffer and contributing to a longer time of skin contact with urine and/or feces, changing its pH and combining humidity with mechanical friction that will cause damage to the skin<sup>3,4,16</sup>.

Research conducted in a tertiary private institution located in the city of São Paulo, with adult and elderly patients admitted to an Intensive Care Center in 2017, showed that patients using diapers had a higher frequency of IAD compared to those who did not have dermatitis ( $p < 0.001$ )<sup>13</sup>.

The type of admission was a factor that was significantly associated with the presence of IAD in this study ( $p = 0.02$ ), showing that 3 (33.3%) patients admitted for trauma and 4 (11.1%) patients with surgical admission were more likely to develop IAD. This finding corroborates the results of a study conducted in 2016 with adult clinical patients in two ICUs of a public teaching hospital in Minas Gerais, which showed a statistically significant association between the presence of IAD and admission due to trauma<sup>4</sup>. Trauma patients are usually more restricted in manipulating or changing their decubitus, which increases the risk of friction, shear, and the frequency with which they become wet, increasing the chance of developing the problem. However, there is a scarcity of studies with similar results<sup>4</sup>.

As for the presence of PU, 6 (13.6%) patients with IAD also had some type of PU, but this relationship was not statistically significant. National and international studies describe that patients with IAD are more susceptible to PU<sup>3,11,19,21</sup>.

A research conducted in long-stay institutions in Minneapolis, USA, described PU as the most striking predictor of IAD, as patients who had some PU in the perineal region were 2.04 times more likely to present IAD<sup>22</sup>. This can be explained by the urine that, together with mechanical friction, reduces the tissue tolerance of the skin, favoring the appearance of PU<sup>6</sup>. IAD and PU share several risk factors, such as reduced mobility, incontinence, and lower Braden scale scores<sup>18</sup>.

Moreover, such studies show a significant association between patients with IAD and a high risk of developing PU according to the Braden scale<sup>18</sup>. Compared to the present study, the mean Braden scale score for patients with IAD was 13.40, characterizing moderate risk of developing PU. It is also noteworthy that, frequently, IADs are confused with PUs in their early stages because they have a very similar visual aspect, but they deserve attention, since they are distinct lesions and have different etiologies<sup>23</sup>.

The lack of standardized and validated instruments and methods for classifying IAD in Brazil causes a great variation in the prevalence of this lesion, besides posing a challenge to health professionals who are often confused<sup>3,6,7,16</sup>. It is worth noting that in 2017, Beeckman and collaborators<sup>24</sup> designed an instrument for categorizing IAD, called GLOBIAD, which standardizes its severity internationally; however, it has not yet been translated and adapted for Brazil, and is little used for Brazilian clinical practice.

Early recognition of the risk factors related to the development of IAD can help prevent this condition. Among the types of skin lesions, this one is still little explored and requires more studies, as well as the identification of more appropriate interventions. The importance of the role of nursing is in prevention and skin care, based on scientific evidence, so that they are prepared to care for the patient in a holistic, effective, and resolute way.

Furthermore, a systematic review of guidelines and consensus statements found that although several organizations, such as Wound, Ostomy and Continence Nurses Society (WOCN), Wund-D.A.CH, and Experts Consensus on the Nursing Practice for Incontinence related Dermatitis in Adults Group, develop guidelines and consensus on IAD, such available guidelines can and should undergo methodological improvements that contribute to the quality, reliability, and

applicability of the best recommendations on this lesion, so that they can be used in clinical practice decision making and contribute to the care provided to patients with IAD<sup>25</sup>.

Among the limitations of this study, the sample size, the absence of records on some study variables (such as weight and height) in the medical records of some patients on the day of collection, as well as the methodological design, given that the point prevalence can be described as a snapshot of the moment, documentary study with data collected from an already structured database, and the characteristics of IAD were not collected, should be considered. It is also noteworthy that the ICUs in the three hospitals where the data were collected had no specific protocol for the prevention of AID.

The present investigation recommends further studies with more robust methodological design and discussions on the subject, in order to contribute to the information about this injury, its prevention, risk factors, and care.

## CONCLUSION

The results of the present study showed a point prevalence of IAD of 9.5% in adult intensive care patients and the factor associated with its occurrence was the type of ICU admission, highlighting trauma admission.

The results found demonstrate the importance of investigating the epidemiology and associated factors, since AID can bring consequences that harm the patient's well-being and the entire process involved their care. Studies on IAD are fundamental for a well-structured, well-founded, and higher quality nursing care, especially when it comes to the most critical patients.

## AUTHORS' CONTRIBUTION

**Conceptualization:** Domingues BW and Nogueira PC; **Methodology:** Domingues BW and Nogueira PC; **Investigation:** Domingues BW; **Writing – First draft:** Domingues BW, Souza TMP and Wojastyk LDMC; **Writing – Review & Editing:** Domingues BW, Souza TMP, Wojastyk LDMC, Santos VLCCG and Nogueira PC; **Funding acquisition:** Nogueira PC and Santos VLCCG; **Resources:** Santos VLCCG and Nogueira PC; **Supervision:** Nogueira PC.

## AVAILABILITY OF RESEARCH DATA

The data will be available upon request.

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