REVIEW ARTICLE

REVISTA ENFERMAGEM ATUAL IN DERME

MEDICAL DEVICE-RELATED PRESSURE INJURIES IN HOSPITALIZED ADULTS: AN INTEGRATIVE REVIEW

LESIONES POR PRESIÓN RELACIONADAS CON DISPOSITIVOS MÉDICOS EN ADULTOS HOSPITALIZADOS: UNA REVISIÓN INTEGRADORA

LESÃO POR PRESSÃO RELACIONADA À DISPOSITIVOS MÉDICOS EM ADULTOS HOSPITALIZADOS: UMA REVISÃO INTEGRATIVA

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Submission: 19-08-2024
Approval: 12-02-2025

RESUMO
Objetivo: verificar na literatura científica evidências dos dispositivos médicos que podem ocasionar lesão por pressão de pele e/ou mucosas em adultos hospitalizados, identificar a prevalência/incidência, local acometido e os fatores relacionados ao surgimento destas lesões. **Método:** revisão integrativa da literatura organizada em seis etapas, desenvolvida entre dezembro de 2023 e julho de 2024. A busca dos estudos ocorreu de forma online, nas bases de dados *Medical Literature Analysis and Retrieval System Online*, na Literatura Latino-Americana e do Caribe em Ciências da Saúde, na Bases de Dados em Enfermagem e no Índice Bibliográfico Español en Ciencias de la Salud, por meio da combinação dos descritores “Lesão por pressão”, “Adulto”, “Equipamentos e Provisões” e da palavra-chave “Dispositivos médicos”, em português, inglês e espanhol. **Resultados:** após aplicar os critérios de seleção, a amostra foi composta por 15 artigos, os dispositivos pontuados como maiores causadores de lesão foram os de assistência respiratória, a prevalência foi avaliada em 10 publicações e variou entre 3,3% e 62,4%, afetando majoritariamente a face. Estiveram relacionados ao aparecimento de lesão a idade, gravidade dos casos clínicos, tempo de internação, número de dispositivos, internação em hospital público, utilização de dispositivos tecnológicos, tempo de uso do dispositivo, edema, adequação dos dispositivos. **Considerações finais**: sugere-se a realização de novas pesquisas que avaliem a efetividade de intervenções, como protocolos, treinamentos ou *bundles*, que visem a redução da incidência e prevalência da lesão por pressão relacionada a dispositivos médicos, principalmente nos locais com valores elevados.
Palavras-chave: Lesão por Pressão; Cuidados de Enfermagem; Equipamentos e Provisões; Revisão Integrativa.

ABSTRACT
Objective: To review the scientific literature for evidence on medical devices that can cause pressure injuries on the skin and/or mucosa in hospitalized adults, identifying their prevalence, incidence, affected sites, and associated risk factors. **Method:** This integrative literature review was conducted in six stages between December 2023 and July 2024. The database search was performed online using the Medical Literature Analysis and Retrieval System Online (MEDLINE), Latin American and Caribbean Health Sciences Literature (LILACS), Nursing Database (BDENF), and Spanish Bibliographic Index in Health Sciences (IBECS). The search strategy combined the descriptors “Pressure Injury,” “Adult,” and “Equipment and Supplies” with the keyword “Medical Devices” in Portuguese, English, and Spanish. **Results:** After applying the selection criteria, 15 articles were included in the final sample. Respiratory support devices were the primary causes of pressure injuries. Prevalence was reported in 10 studies, ranging from 3.3% to 62.4%, with the face being the most commonly affected area. Factors associated with injury development included patient age, severity of clinical conditions, length of hospitalization, number of devices used, admission to a public hospital, use of technological devices, duration of device use, presence of edema, and proper device adjustment. **Final considerations:** Further research is needed to evaluate the effectiveness of interventions, including protocols, training programs, and prevention bundles, in reducing the incidence and prevalence of medical device-related pressure injuries, particularly in high-risk settings.
Keywords: Pressure Injury; Nursing Care; Equipment and Supplies; Integrative Review.

RESUMEN
Objetivo: Analizar en la literatura científica la evidencia sobre dispositivos médicos que pueden provocar lesiones por presión en la piel y/o mucosas de adultos hospitalizados, con el fin de identificar su prevalencia o incidencia, las áreas más afectadas y los factores asociados a su aparición. **Método**: Revisión integradora de la literatura realizada en seis etapas, llevada a cabo entre diciembre de 2023 y julio de 2024. La búsqueda de estudios se realizó en línea a través de bases de datos como el Medical Literature Analysis and Retrieval System, la Literatura Latinoamericana y del Caribe en Ciencias de la Salud, las Bases de Datos de Enfermería y el Índice Bibliográfico Español en Ciencias de la Salud. Para ello, se utilizaron los descriptores "Lesión por presión", "Adulto", "Equipamiento y Provisiones" y la palabra clave "Dispositivos médicos", en portugués, inglés y español. **Resultados**: Tras aplicar los criterios de selección, la muestra quedó conformada por 15 artículos. Los dispositivos de asistencia respiratoria fueron identificados como la principal causa de lesiones por presión. La prevalencia fue analizada en 10 estudios y varió entre el 3,3% y el 62,4%, afectando principalmente el rostro. Factores como la edad, la gravedad del estado clínico, la duración de la hospitalización, la cantidad de dispositivos utilizados, la internación en hospitales públicos, el uso de tecnologías médicas, el tiempo de exposición al dispositivo, la presencia de edema y la correcta adaptación del dispositivo estuvieron asociados con la aparición de estas lesiones. **Consideraciones finales**: Se recomienda realizar más investigaciones para evaluar la efectividad de intervenciones como protocolos, capacitaciones o paquetes de medidas dirigidas a reducir la incidencia y prevalencia de las lesiones por presión asociadas al uso de dispositivos médicos, especialmente en contextos con altas tasas de ocurrencia.
Palabras clave: Lesión por presión; Cuidados de Enfermeria; Equipos y Suministros; Revisión Integradora.

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INTRODUCTION

The understanding of pressure injuries (PIs) has evolved in recent years, prompting a revision of their definition and classification. As a result, the latest classification by the NPUAP (2019) now includes PIs associated with medical devices applied to the skin or mucosa. These injuries occur due to prolonged contact with therapeutic equipment, which can lead to tissue damage and complications[1].

Although medical device-related pressure injuries (MDRPIs) have distinct classifications, they are still often considered a single type of injury in the literature, regardless of the affected tissue. Reported incidence rates of MDRPIs vary significantly, ranging from 6.1% to 81.87%. A study conducted in the Netherlands found an incidence of 20.1%, with the most frequently implicated devices being urinary and oxygen catheters, tracheal tubes, and nasogastric feeding tubes[2-4].

Although MDRPIs are a serious adverse event, studies indicate that nursing professionals often have limited knowledge on the topic, especially concerning preventive measures. This underscores the need for ongoing education in this area[5].

Preventing MDRPIs remains the most effective strategy for reducing their occurrence. Key measures include selecting appropriate devices, ensuring proper fixation and timely replacement, regularly assessing the skin in contact with devices, using protective dressings to minimize friction, maintaining proper positioning aligned with anatomical structures, repositioning patients while readjusting equipment as needed, promptly removing devices when no longer necessary, providing adequate nutritional support, and systematically documenting nursing care[3]. Identifying the devices that contribute to MDRPIs on both the skin and mucosa, along with determining their prevalence, is essential for developing prevention protocols, enhancing staff training, and ultimately reducing patient harm.

OBJECTIVE

This study aims to review the scientific literature for evidence on medical devices that can cause pressure injuries on the skin and/or mucosa in hospitalized adults. It seeks to identify the prevalence and incidence of these injuries, determine the most affected sites, and analyze the factors contributing to their development.

METHODS

This study is an integrative literature review structured in six stages: defining the research question, conducting a bibliographic search, extracting data, critically evaluating the studies, analyzing and summarizing findings, and synthesizing knowledge[6]. The review was performed between December 2023 and July 2024, following the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist[7].

The PICo strategy[8] was used to define the guiding research question. In this framework,

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"P" represents the population of hospitalized adult patients, "I" refers to medical devices used in healthcare, and "Co" encompasses the context and prevalence of pressure injuries affecting the skin and mucosa.

Using this framework, the guiding research questions were formulated as follows: Which medical devices can cause pressure injuries on the skin and/or mucosa in hospitalized adults? What is the prevalence and/or incidence of these injuries? Which anatomical sites are most affected, and what factors contribute to their development? The data search was conducted online on December 20, 2023, using the following databases: Medical Literature Analysis and Retrieval System Online (MEDLINE), Latin American and Caribbean Health Sciences Literature (LILACS), Nursing Database (BDENF), and Spanish Bibliographic Index in Health Sciences (IBECS). To ensure a comprehensive literature search, the strategy combined the descriptor “lesão por pressão” (pressure injury), sourced from the Health Sciences Descriptors (DeCS), with the keyword “dispositivos médicos” (medical devices) in Portuguese, English, and Spanish for searches in LILACS, IBECS, and BDENF. Additionally, the descriptors “Pressure Ulcer,” “Equipment and Supplies,” and “Adult”, along with their synonyms from the Medical Subject Headings (MeSH), were used. These terms were combined using the Boolean operators OR and AND. In databases that allowed it, the search was conducted in the title and abstract of publications (Table 1).

Table 1 - Search Expressions Used in the Study. Porto Alegre, Rio Grande do Sul, Brazil, 2024

DATABASES	SEARCH EXPRESSION
LILACS, IBECS and BDENF	("*lesão por pressão*") AND ("*dispositivo médico*") AND (la:("en" OR "pt" OR "es")) AND (year_cluster:[2018 TO 2023]) ("*Úlcera por Presión*") AND ("*dispositivo medico*") AND (la:("en" OR "pt" OR "es")) AND (year_cluster:[2018 TO 2023]) ("Pressure Ulcer") AND ("medical device") AND (year_cluster:[2018 TO 2023]) AND (la:("en" OR "pt" OR "es")) AND (year_cluster:[2018 TO 2023])
MEDLINE	(("Pressure Ulcer"[Mesh Terms] OR "Pressure Injury"[Text Word]) AND ("Equipment and Supplies"[Mesh Terms]OR "Supplies and Equipment"[Text Word] OR "Apparatus and Instruments"[Text Word] OR "Instruments and Apparatus"[Text Word] OR Supplies [Text Word] OR Inventories [Text Word] OR Inventory[Text Word] OR "Medical Devices"[Text Word] OR "Medical Device"[Text Word] OR Devices[Text Word] OR Device[Text Word] OR Equipment[Text Word])) AND ("Adult"[Mesh Terms] OR Adults[text word]) Filters: in the last 5 years, English, Portuguese, Spanish

Source: The Authors.

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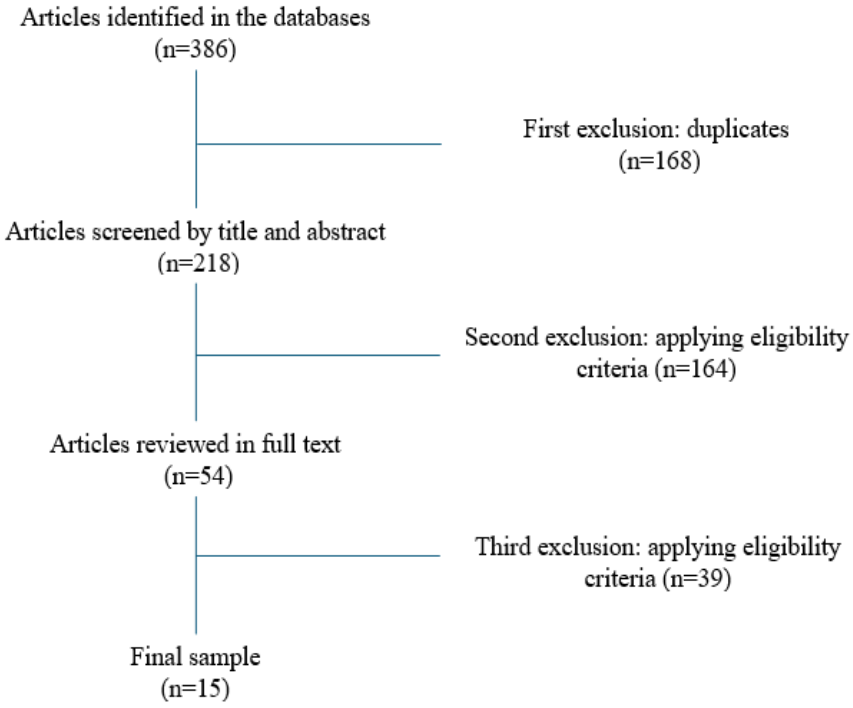
Original articles from observational studies published between 2018 and 2023 in English, Spanish, or Portuguese that addressed the guiding research question were included in the review. Publications were excluded if they were theses, dissertations, editorials, review articles, manuals, protocols, book chapters, reflections, expert opinions, commentaries, preprints, media files, or studies involving children or animals. Duplicate publications were counted only once.

For data extraction, the selected articles were first screened by reviewing their titles, abstracts, and keywords, followed by a full-text analysis of the chosen studies. To characterize the studies, a form developed by the authors was used, collecting information such as the article title, journal, year, language, and country of publication. Additionally, data relevant to the research topic were extracted, including the study objective, types of medical devices, prevalence/incidence, affected sites, and associated factors. Data analysis was conducted descriptively, with the results presented in a flowchart and tables. Additionally, ethical considerations were maintained by ensuring proper citation of sources and accurate attribution of authors' definitions.

RESULTS

The database search identified a total of 386 articles: 287 from MEDLINE, 51 from BDENF, 44 from LILACS, and 4 from IBECS. The stages of the publication selection process are detailed in Figure 1.

Figure 1 – Flowchart of the article selection process. Porto Alegre, Rio Grande do Sul, Brazil, 2024.



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The final sample included 15 publications (Table 2), with English as the predominant language (13 articles). Most studies (13 articles) used a cross-sectional design. Eleven were conducted in intensive care units (ICUs), one in an emergency department, and three in general healthcare settings. In terms of publication year, four articles were from 2023, six from 2022, two from 2021, one from 2020, one from 2019, and one from 2018, totaling 15 articles.

Table 2 - Characterization of the studies according to authorship, year of publication, journal, language, sample, and study location. Porto Alegre, RS, Brazil, 2024.

N	Autoria e Ano de publicação	Periódico e idioma de publicação	Amostra e local do estudo	Tipo de estudo
1	Reisdorfer N et al.[2] 2023	REUFSM Português/inglês	47 pacientes (1.579 dispositivos em 292 avaliações) da UTI de um hospital público do Brasil	transversal
2	Yigitoglu eT et al.[9] 2023	Journal of Tissue Viability *Inglês*	132 pacientes da UTI COVID-19 de um hospital universitário	transversal
3	Luo Z et al.[10] 2023	BMC Emergency Medicine Inglês	101 pacientes que utilizaram serviço de emergência na China	transversal
4	Yalçin M et al.[11] 2023	Journal of Clinical Nursing Inglês	200 pacientes das UTI de dois hospitais universitários de Izmir.	transversal
5	Coyer F et al.[12] 2022	Intensive & Critical Care Nursing Inglês	631 pacientes de uma UTI de um hospital de Queensland, Austrália.	transversal
6	Najjar YW et al.[13] 2022	Health Science Reports Inglês	318 pacientes de UTI em 10 hospitais da Jordânia	transversal
7	Shimura T et al.[14] 2022	Wound Repair and Regeneration Inglês	1418 pacientes admitidos na UTI do hospital universitário em Tóquio, Japão	coorte

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8	Fulbrook PRN et al.[15] 2023	Journal of Clinical Nursing Inglês	Foram avaliadas 414 LPRDM de um hospital geral de Queensland, Austrália,	transversal
9	Qin L.[16] 2021	Advances in Skin & Wound Care *Inglês*	156 pacientes com intubação endotraqueal de uma UTI em um hospital de primeira classe da China	transversal
10	Dang W et al.[17] 2022	Journal of Clinical Nursing *Inglês*	694 pacientes em 66 UTI para adultos em 30 hospitais na China	transversal
11	Galetto SGS et al.[18] 2021	Revista da Escola de Enfermagem da USP Português/Inglês	93 pacientes de uma UTI adulto de um hospital público de Florianópolis, Santa Catarina	transversal
12	Masyitha K et al.[19] 2020	*Enfermaria Clínica* Inglês	32 pacientes internados na UTI de um hospital na Indonésia	coorte
13	Martel T et al.[20] 2020	Journal of Wound, Ostomy and Continence Nursing	30 Pacientes de UTI em um hospital universitário	transversal
14	Rashvand F et al.[21] 2019	International Wound Journal Inglês	404 pacientes de três hospitais em Qazvin, Irã.	transversal
15	Kaysen AS et al.[22] 2018	Advances in Skin & Wound Care Inglês	102.865 pacientes adultos internados em instituições de saúde dos Estados Unidos e Canadá	Transversal

Source: the authors.

Table 3 presents the study objectives and key findings. Respiratory support devices were the most frequently identified causes of MDRPIs. Prevalence was reported in 10 studies, ranging from 3.3% to 62.4%. The face was the most commonly affected site. Factors associated with MDRPIs included age, severity of clinical conditions, length of hospitalization, number of devices used, admission to a public hospital, use of technological devices, duration of device use, presence of edema, and proper device adjustment, among others.

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Table 3 - Characterization of the studies according to objective and results. Porto Alegre, Rio Grande do Sul, Brazil, 2024.

N	Study Objective	Study Results
1	To determine the incidence of MDRPIs and associated factors in the ICU[2]	Prevalence: 233 injuries (14.9%); Incidence: 6.1% Medical Device: Tracheal Tube (TOT) (20.9%) Site: Ears (10.4%); Face (7.8%) Stage: Stage 1 (63.3%) Risk Factors: Patients' clinical characteristics were not associated with injury data
2	To determine the incidence of MDRPIs in patients treated in the COVID-19 ICU[9]	Incidence: 59.1% Medical Devices: Tracheal Tube (TOT) (31.2%); Non-Invasive Ventilation (NIV) (23.4%); High-Flow Nasal Cannula (11.3%); Nasogastric Tube (10.6%) Site: Nose (28.8%); Mouth (25.8%); Ear (12.9%); Lip (9.1%); Cheek (8.3%) Stage: Stage 2 (28.8%); Stage 1 (19.7%); Stage 3 (9.1%); Mucosal Injuries (12.9%); Suspected Deep Tissue Injuries (9.1%) Time to Pressure Injury: 3 days (25.7%) Risk Factors: Mean age of 65.45 ± 2.462 years, invasively ventilated (51.3%), enterally fed (46.2%), in the prone position (78.2%), and Braden score ≤12 (50%)
3	To clarify the prevalence and characteristics of MDRPIs during ambulance transfers[10]	Incidence: 8% Medical Devices: Cervical collar, respiratory devices, and spinal board Site: Mandible (40%); Heel (30%); Nasal bridge (20%) Stage: Stage 1 (100%)
4	To determine the point prevalence and risk factors associated with MDRPIs in ICU patients in Turkey[11]	Prevalence: 32.5% Medical Devices: Nasogastric tube (29.2%); Tracheal tube (TOT) (18.5%); CPAP mask (15.4%) Site: Face (71%) Type: Mucosal injuries (53.8%) Stage: Stage 2 (18.5%) Risk Factors: The risk was 14 times higher in patients hospitalized for 9 to 16 days and 13 times higher in those receiving mechanical ventilatory support.
5	To report the prevalence of MDRPIs in critically ill adult ICU patients and explore patient characteristics associated with injury development[12]	Incidence: 11.3% (71/631) Medical Devices: Nasogastric/Nasojejunal Tubes (41%); Tracheal Tube (TOT) (27%) Risk Factors: Total number of devices, ICU length of stay, male sex, and increased disease severity score at admission

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6	To determine the prevalence and risk of MDRPIs in ICUs in Jordan, identifying preventive measures, assessing the most commonly used medical devices causing ulcers, and evaluating the relationship between prevention measures and ulcer development[13]	Prevalence: 38.1% Medical Devices: Face masks; Tracheal Tube (TOT); Pulse oximetry; Intravenous catheters Site: Hands and arms (29.5%); Lips (15.1%); Cheeks (12.1%) Stage: Stage 1 (77.3%) Risk Factors: Older age, hospitalization in public hospitals, and prolonged hospital stay. Only 17% of patients received adequate preventive measures. More severe patients are at higher risk.
7	To determine the cumulative incidence of pressure injuries and MDRPIs in critically ill patients and identify corresponding risk factors[14]	Prevalence: 3.3%; Incidence: 3.6% Medical Devices: Compression stockings (22.7%); Arterial line (7.6%); Blood pressure cuff (6.1%) Site: Forearm (19.7%); Foot (15.2%) Risk Factors: Presence of pressure injuries at admission, lactate levels, D-dimer values, and use of ECMO.
8	To analyze the incidence and characteristics of MMPRIs in a tertiary-level general hospital among acute patients[15]	There were 414 reports of MDRPIs, with 74.4% occurring in ICU patients. Incidence: 0.1% in the hospital; 2.4% in the ICU. Medical Devices: In the ICU, Tracheal Tube (TOT) (70.3%); Urinary Catheter (15.5%); Gastric Tube. In the hospital, Urinary Catheter (51.4%). Site: Lips (35.6%); Mouth (28.8%). Time: The average time from device insertion to the notification of an MDRPI was 3 days.
9	To investigate the characteristics and risk factors of MDRPIs related to tracheal tubes in ICU patients[16]	Incidence: 23.7% Site: Lip (76.7%) Risk Factors: There was an association between the type of endotracheal intubation, duration of tube placement, aspiration, tube fixation, and types of fixators.
10	To assess the prevalence of MDRPIs in ICU patients and analyze risk factors[17]	Prevalence: 13.1% Medical Devices: CPAP or BiPAP masks (25%) Site: 98 anatomical sites in total, with Finger (32.7%) and Nose (18.4%) being the most affected Stage: Stage 1 (54.1%); Stage 2 (15.3%); Mucosal MDRPIs (15.3%) Risk Factors: Lower Braden scores and skin edema were identified as risk factors.
11	To determine the prevalence of MDRPIs in critically ill patients and analyze associated factors[18]	Prevalence: 62.4% Medical Devices: Tracheal Tube (TOT) (50%), Polyvinyl Nasogastric Catheter (44.1%), Indwelling Urinary Catheter (28.6%) Site: Auricular region, Urethral meatus, and Nasal ala Stage: Stage 2 Risk Factors: Edema and duration of device use

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12	To describe MDRPIs in patients with prolonged bed rest in an adult ICU in Indonesia[19]	Prevalence: 21.9% Medical Devices: Pulse oximetry; Blood pressure cuffs; Restraints Site: Finger region (37.5%) Stage: Stage 2 (57.1%)
13	To review the incidence of MDRPIs in a university hospital during the pandemic[20]	Prevalence: 27.5% of patients developed pressure injuries, with 50% classified as MDRPIs. Medical Devices: Tracheal Tube (TOT) (74%) Site: Face, with 94% attributed to the prone position.
14	To investigate the incidence and risk factors for MDRPIs in Iran[21]	Prevalence: 20.54% Medical Devices: Nasal oxygen catheter (31 cases); Oxygen face masks (23 cases); Tracheal Tube (TOT) (17 cases) Stage: Stage 1 (70.11%); Stage 2 (19.5%) Risk Factors: Braden score, older age, male sex, average length of hospital stay, and presence of pressure injuries.
15	To examine the prevalence and characteristics of MDRPIs in a large, generalizable database[22]	Prevalence: 7.2% Medical Devices: Nasal oxygen tubes (26%); Casts/splints (12%); Non-Invasive Ventilation (NIV) (9%) Stage: Stage 1 or Stage 2 (58%) Site: Ears (29%); Feet (12%) Time: MDRPIs developed **3 days faster** than other pressure injuries.

Source: the authors.

MDRPI: Medical Device-Related Pressure Injury; MD: Devices causing injury; RF: Factors related to injury occurrence; PI: Pressure Injury; MMPI: Mucosal Membrane Pressure Injury; TOT: Tracheal Tube; NIV: Non-Invasive Ventilation; ICU: Intensive Care Unit; E1,2: Stage 1, 2.

DISCUSSION

The data indicate that most studies were conducted in Intensive Care Units (ICUs)[2,9,11-14,16-20]. This is likely due to the higher risk of pressure injuries (PIs) in ICU patients, attributed to their hemodynamic instability and the extensive use of medical devices[23]. As a result, the high incidence of device-related injuries can be explained by both the frequent use of these devices and the severity of patients' conditions.

Prevalence rates of pressure injuries in ICUs ranged from 3.3%[14] to 62.4%[18]. In the study reporting the highest prevalence, 58 out of 93 patients developed device-related injuries, primarily linked to tracheal tubes, nasogastric tubes, and urinary catheters[18], with stage 2 injuries being the most common. The main contributing factors included severe edema, low Braden and Glasgow scale scores, prolonged ICU stay, and hospitalization due to causes classified under other medical conditions.

The devices most frequently associated with MDRPIs included tracheal tubes, nasogastric tubes, non-invasive mechanical

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ventilation masks, high-flow nasal cannulas, and urinary catheters[2,9,11-13,15,17,18,20]. Other reported devices linked to MDRPIs included pulse oximeters, intravenous catheters, blood pressure cuffs, mechanical restraints, compression stockings, and arterial lines[13,14,20]. A higher prevalence of injuries was correlated with both the number of devices used and the duration of their use[18]. Therefore, nurses must remain vigilant to risk factors, and the early implementation of preventive measures is crucial to reducing injury incidence in ICU patients.

This issue appears to have been intensified by the pandemic context[9,20]. During the COVID-19 pandemic, the rise in ICU admissions, the use of prone positioning to manage Acute Respiratory Syndrome, and increased exposure to therapeutic devices contributed to higher rates of MDRPIs.

During this period, the tracheal tube (TOT) was the device most commonly associated to MDRPIs, representing 31.2% of cases[9]. In Turkey, a study reported an MDRPI prevalence of 32.5%, with the face being the most affected area, largely due to the use of prone positioning[20].

Only one study reported data on mobile transfer care. In this population, the mandible was the most vulnerable site for MDRPIs due to the use of cervical collars. The heel and nasal bridge were also commonly affected, primarily due to exposure to respiratory devices and stretchers.

Furthermore, the study identified that these injuries are more prevalent during prolonged ambulance transport compared to certain inpatient units. However, due to the limited research in this area and the unique nature of this type of care, further studies are required to validate and expand these findings[10].

Two studies reported that MDRPIs typically develop within an average of three days[15,22]. This finding underscores the importance of implementing preventive measures and closely monitoring patients from the moment the device is applied.

Comparing national and international data reveals significant variation in incidence and prevalence rates; however, the same medical devices consistently emerge as the leading causes of injury. A national study reported the highest MDRPI prevalence at 62.4%[18], with tracheal tubes (50.0%), nasogastric catheters (44.1%), and indwelling urinary catheters (28.6%) being the primary contributors.

A study conducted in an adult ICU in southern Brazil reported an MDRPI prevalence of 14.9% and an incidence of 6.14%, with the tracheal tube being the most frequently associated device. These findings highlight the need for effective preventive measures to reduce MDRPIs in intensive care settings[2].

Risk factors for MDRPIs include the severity of the patient's condition, the use of devices made from rigid or less flexible materials, prolonged hospitalization,

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compromised skin integrity due to moisture, friction between the skin and devices, administration of vasopressor and sedative medications, inadequate skin assessment and device repositioning, and limited continuing education for healthcare teams. These factors underscore the critical need for effective preventive measures[24].

The findings of this study highlight the importance of implementing educational programs to train the multidisciplinary team in MDRPI prevention strategies. These injuries are often underestimated by some healthcare professionals, who may view them as unavoidable due to the complexity of the patient's clinical condition.

However, the implementation of prevention bundles[25] by healthcare institutions has proven to be effective. These measures include regular skin inspections under medical devices, rotation of fixation sites, use of predictive risk assessment scales at patient admission, and application of prophylactic dressings. Such strategies can enhance care processes related to this critical clinical indicator.

One limitation of this study was the predominance of research conducted in ICUs, resulting in limited data on MDRPIs in other hospital settings. Therefore, further studies in diverse healthcare environments are recommended to expand understanding of this issue.

FINAL CONSIDERATIONS

This study reviewed the scientific literature on medical device-related pressure injuries (MDRPIs) in hospitalized adults, focusing on their prevalence, the most commonly associated devices, and the factors contributing to their development. The analysis showed a high incidence of MDRPIs in ICUs, with respiratory support devices, particularly tracheal tubes, being the leading causes. These findings highlight the need for targeted preventive measures to reduce MDRPIs, which are often seen as unavoidable but can be significantly minimized through proper interventions.

Further research is required to assess the effectiveness of interventions, including protocols, training programs, and prevention bundles, in reducing the incidence and prevalence of MDRPIs, especially in settings with high occurrence rates.

The findings of this study underscore the need for a systematic and preventive approach to managing MDRPIs, with nursing playing a key role in this process. Establishing clear protocols, providing ongoing education for healthcare professionals, and implementing evidence-based practices are essential to reducing MDRPIs. Achieving better outcomes and ensuring safer, more effective care for hospitalized patients requires awareness and commitment from the entire healthcare team.

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REFERENCES

1. Kottner J, Cuddigan J, Carville K, Balzer K, Berlowitz D, Law S, et al. Prevention and treatment of pressure ulcers/injuries: The protocol for the second update of the international Clinical Practice Guideline 2019. J Tissue Viability. 2019 May;28(2):51-8. doi: 10.1016/j.jtv.2019.01.001.

2. Reisdorfer N, Nascimento E, Lazzari DD, Echevarría-Guanilo ME, Galetto SGS, Malfussi LBH. Incidência de lesões por pressão relacionadas a dispositivos médicos em unidade de terapia intensiva adulto. Revista Enfermagem UFSM. 2023;13:e32. doi: 10.5902/2179769274377.

3. Cavalcanti EO; Kamada I. Lesão por pressão relacionada a dispositivos médicos: frequência e fatores associados. ESTIMA, Braz. J. Enterostomal Ther., 2021, 20:e0322. doi: 10.30886/estima.v20.1146_PT.

4. Saleh MYN, Ibrahim EIM. Prevalence, severity, and characteristics of medical device related pressure injuries in adult intensive care patients: A prospective observational study. Int Wound J. 2023 Jan;20(1):109-19. doi: 10.1111/iwj.13845.

5. Soldera D, Girondi JBR, Hammerschmidt KS A, Amante LN, Neta ELO. Lesões por pressão relacionadas a dispositivos médicos na prática clínica de enfermeiros. Enferm Foco. 2021;12(2):209-22. doi: 10.21675/2357-707X.2021.v12.n2.3427.

6. Paula CC, Padoin SM de M, Galvão CM. Revisão integrativa como ferramenta para tomada de decisão na prática em saúde. Vol. I, Porto Alegre: Moriá Editora; 2018. p. 52–76.

7. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021 Mar 29;372:n71. doi: 10.1136/bmj.n71.

8. da Costa Santos CM, de Mattos Pimenta CA, Nobre MR. The PICO strategy for the research question construction and evidence search. Rev Lat Am Enfermagem. 2007 May-Jun;15(3):508-11. doi: 10.1590/s0104-11692007000300023.

9. ogluk Yiğitoğlu E, Aydoğan S. Determination of medical device-related pressure injury in COVID-19 patients: A prospective descriptive study. J Tissue Viability. 2023 Feb;32(1):74-8. doi: 10.1016/j.jtv.2022.10.004.

10. Luo Z, Liu S, Yang L, Zhong S, Bai L. Ambulance referral of more than 2 hours could result in a high prevalence of medical-device-related pressure injuries (MDRPIs) with characteristics different from some inpatient settings: a descriptive observational study. BMC Emerg Med. 2023 Apr 25;23(1):44. doi: 10.1186/s12873-023-00815-9. Erratum in: BMC Emerg Med. 2023 May 23;23(1):50. doi: 10.1186/s12873-023-00822-w.

11. Yalçin M, Güneş Ü. A point prevalence study of medical device-associated pressure injuries: A cross-sectional study. J Clin Nurs. 2023 Oct;32(19-20):7618-25. doi: 10.1111/jocn.16831.

12. Coyer F, Cook JL, Doubrovsky A, Vann A, McNamara G. Exploring medical device-related pressure injuries in a single intensive care setting: A longitudinal point prevalence study. Intensive Crit Care Nurs. 2022 Feb;68:103155. doi: 10.1016/j.iccn.2021.103155.

13. Najjar YW, Saleh MY, Hassan ZM. Medical device related pressure ulcers in Jordan: Prevalence study among critically ill patients. Health Sci Rep. 2022 May 5;5(3):e620. doi: 10.1002/hsr2.620.

14. Shimura T, Nakagami G, Ogawa R, Ono S, Takahashi T, Nagata Met al. Incidence of and risk factors for self-load-related and medical device-related pressure injuries in critically ill patients: A prospective observational cohort study. Wound Repair Regen. 2022 Jul;30(4):453-67. doi: 10.1111/wrr.13022.

15. Fulbrook P, Lovegrove J, Butterworth J. Incidence and characteristics of hospital-acquired mucous membrane pressure injury: A five-year analysis. J Clin Nurs. 2023 Jul;32(13-14):3810-9. doi: 10.1111/jocn.16473.

16. Qin L, Yun W, Hang C. Risk Factors of Endotracheal Intubation-Related Pressure Injury among Patients Admitted to the ICU. Adv Skin Wound Care. 2021 Mar 1;34(3):144-8. doi: 10.1097/01.ASW.0000732896.29121.06.

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17. Dang W, Liu Y, Zhou Q, Duan Y, Gan H, Wang L, et al. Risk factors of medical device-related pressure injury in intensive care units. J Clin Nurs. 2022 May;31(9-10):1174-83. doi: 10.1111/jocn.15974.

18. Galetto SGDS, do Nascimento ERP, Hermida PMV, Busanello J, de Malfussi LBH, Lazzari DD. Medical device-related pressure injuries in critical patients: prevalence and associated factors. Rev Esc Enferm USP. 2021 Aug 23;55:e20200397. English, Portuguese. doi: 10.1590/1980-220X-REEUSP-2020-0397.

19. Masyitha, HK; Puspita D, Suriadi U. Pressure ulcers related to medical device in intensive care in Indonesia: A prospective study. Enfermería Clínica. 2020 Mar;30(Suppl 3):87–91. doi: 10.1016/j.enfcli.2020.01.006

20. Martel T, Orgill DP. Medical Device-Related Pressure Injuries During the COVID-19 Pandemic. J Wound Ostomy Continence Nurs. 2020 Sep/Oct;47(5):430-34. doi: 10.1097/WON.0000000000000689.

21. Rashvand F, Shamekhi L, Rafiei H, Nosrataghaei M. Incidence and risk factors for medical device-related pressure ulcers: The first report in this regard in Iran. International Wound J. 2020; 17(2): 436-42. doi: 10.1111/iwj.13290.

22. Kayser SA, VanGilder CA, Ayello EA, Lachenbruch C. Prevalence and Analysis of Medical Device-Related Pressure Injuries: Results from the International Pressure Ulcer Prevalence Survey. Adv Skin Wound Care. 2018 Jun;31(6):276-85. doi: 10.1097/01.ASW.0000532475.11971.

23. Chen G, Li X, Li X, Liu S, Xie J. Mucosal membrane pressure injury in intensive care units: A scoping review. Intensive Crit Care Nurs. 2024 Feb;80:103560. doi: 10.1016/j.iccn.2023.103560.

24. Cavalcanti EO, Kamada I. Medical device related pressure injury on adults: an integrative review. Texto Contexto – Enfermagem. 2020;29:e20180371. doi: 10.1590/1980-265X-TCE-2018-0371.

25. Silveira NP, Busanello J, Potter R, Galetto GSGS, Carvalho CCR, Siqueira LM. Bundle para a prevenção de lesões por pressão relacionadas a dispositivos médicos em pacientes críticos. Rev Enferm Atual In Derme. 2021;95(36):e-021177. doi: 10.31011/reaid-2021-v.95-n.36-art.1103.

Funding and Acknowledgements:

Provide the funding institution.

Acknowledgements are optional for participants not considered authors.

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Declaration of conflict of interest

Nothing to declare.

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