Risk factors for pressure injury in critically ill polytraumatized patients: A systematic review

Fatores de risco para a lesão por pressão em pacientes críticos politraumatizados: Revisão sistemática

Factores de riesgo de lesión por presión em pacientes politraumatizados em estado crítico: Uma revisión sistemática

RESUMO

Objetivo: Identificar, na literatura, fatores de risco relacionados ao desenvolvimento de lesão por pressão em pacientes críticos politraumatizados. Método: Revisão sistemática da literatura. Utilizou-se a estratégia PICO para definição da questão de pesquisa. Os estudos coletados foram selecionados por 3 pesquisadores independentes por meio da plataforma Rayyan QCRI tendo como critério de elegibilidade estar publicado em português, inglês e espanhol e disponíveis eletronicamente. Resultados: A amostra foi composta por 3 artigos que atenderam ao objetivo. O fator de risco comum aos três estudos foi a hipóxia, possivelmente em decorrência de hipovolemia ou necessidade da ventilação mecânica. A imobilidade, o uso de substâncias vasoativas, as alterações de temperatura e a condição nutricional do paciente foram fatores também evidenciados e relacionados a lesão por pressão nesses pacientes. Conclusão: O risco aumentado da lesão por pressão nessa população deve ser melhor explorado para definir estratégias eficazes de cuidado para prevenção dessa complicação.

DESCRITORES: Traumatismo Múltiplo; Fatores de Risco; Lesão por Pressão; Cuidados Críticos; Cuidados de Enfermagem.

ABSTRACT

Objective: To identify, in the literature, risk factors related to the development of pressure injuries in critically ill polytraumatized patients. Method: Systematic literature review. The PICO strategy was used to define the research question. The collected studies were selected by 3 independent researchers using the Rayyan QCRI platform, with the eligibility criteria being published in Portuguese, English and Spanish and available electronically. Results: The sample consisted of 3 articles that met the objective. The risk factor common to the three studies was hypoxia, possibly due to hypovolemia or the need for mechanical ventilation. Immobility, the use of vasoactive substances, changes in temperature and the patient's nutritional condition were also evidenced factors related to pressure injuries in these patients. Conclusion: The increased risk of pressure injury in this population should be further explored to define effective care strategies to prevent this complication.

DESCRIPTORS: Multiple Trauma; Risk factors; Pressure Injury; Critical Care; Nursing care.

RESUMEN

Objetivo: Identificar en la literatura los factores de riesgo relacionados con el desarrollo de lesiones por presión en pacientes politraumatizados en estado crítico. Método: Revisión sistemática de la literatura. Se utilizó la estrategia PICO para definir la pregunta de investigación. Los estudios recopilados fueron seleccionados por 3 investigadores independientes utilizando la plataforma Rayyan QCRI, con los criterios de elegibilidad publicados en portugués, inglés y español y disponibles electrónicamente. Resultados: La muestra estuvo conformada por 3 artículos que cumplieron con el objetivo. El factor de riesgo común a los tres estudios fue la hipoxia, posiblemente por hipovolemia o por la necesidad de ventilación mecánica. La inmovilidad, el uso de sustancias vasoactivas, los cambios de temperatura y el estado nutricional del paciente también fueron evidenciados como factores relacionados con las lesiones por presión en estos pacientes. Conclusión: el aumento del riesgo de lesión por presión en esta población debe explorarse más a fondo para definir estrategias de atención efectivas para prevenir esta complicación.

DESCRIPTORES: Trauma Múltiple; Factores de riesgo; lesión por presión; Cuidado crítico; Cuidado de enfermera.

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INTRODUCTION

Pressure injury (PI) is defined, according to the National Pressure Ulcer Advisory Panel, [1] as localized damage to the skin and/or underlying soft tissue usually over a bony prominence, related to medical devices or otherwise. Its etiology is of multicausal origin, being influenced by, in addition to shear force and excessive pressure at a given point, nutrition, tissue microclimate, perfusion and comorbidities.[2]

This reality is present in many people around the world. In the United States of America, the incidence of PIs corresponds to 2.5 million people per year, among these, 60,000 progress to death. [3] In Brazil, PI is the most reported adverse event related to health care from July 2020 to June 2021, with an approximate value of 49 thousand cases. [4] It is noteworthy that part of these events are underreported, which may indicate even higher numbers of these data that may not have been reported.

The involvement of a PI in a patient is considered a negative indicator of the quality of care in health and nursing services, and its prevention is extremely relevant for patient safety. [2] Despite the modernization and technology of health care, the incidence and prevalence of PI in Intensive Care Units (ICU) are high. [5] Patients admitted to ICUs generally do not notice the increase in pressure at certain points of contact with the bed due to factors such as sedation, analgesia, and/or muscle relaxants. [6] In addition, the high number of medical devices in these patients can lead to lesions in unusual body regions. [7]

The involvement of a PI in a patient is considered a negative indicator of the quality of care in health and nursing services, and its prevention is extremely relevant for patient safety.

The association of PI and trauma, multiple or not, brings together two issues that are objects of study and research for nursing and of great concern for health services. Trauma is related to any injury caused by aggressive agents of any etiology. From this definition, the term "polytrauma" is derived, conceptualized as multisystem damage, almost always of surgical connotation, with special and/or specific therapeutic demands that require a quick and critical assessment of the traumatized patient. [8]

As well as the incidence of PI, the number of traumas in 2017, according to the Global Burden of Disease, related to falls or car accidents was 226.2 million that left short and long-term disabilities in affected individuals.[9] Consequently, a substantial number of people with multiple injuries need intensive care, given the limited mobility often presented by these patients and the prolonged hospital stay, factors considered as some of the risks for the development of PI. [6,10]

PI presents itself as a complex problem and a multidisciplinary challenge because it involves the quality of life of patients and economic aspects, since it consumes a large amount of resources from the he-

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alth and nursing system, due to prolonged and high-cost treatment. [2,11] In this way, studies that go into greater depth on the subject may help in the elaboration of strategies to avoid PI. In view of the above, the study aimed to identify, in the literature, risk factors related to the development of PI in critically injured polytraumatized patients.

METHOD

This study is a systematic literature review, carried out from February to March 2022. Six steps were followed for its development: definition of the research question; identification of databases, descriptors and search strategies; definition of inclusion and exclusion criteria; search in databases with three independent researchers; comparison of examiner searches and selection of studies; and critical and directed analysis of the studies included in the review after applying the inclusion and exclusion criteria.

The research question was defined using the PICO strategy, which is the acronym for the words Patient, Intervention, Comparison and Outcomes. Thus, the strategy was outlined as follows: P refers to critically injured polytraumatized patients, I to risk factors for pressure injuries, C does not apply to the study because it is a clinical study and O to the prevention of pressure injuries. It was then defined as a guiding question: What are the risk factors related to the development of pressure injuries in critically injured polytraumatized patients?

The following databases were defined as data sources: PubMed®/MEDLINE®, Latin American and Caribbean Health Sciences Literature (LILACS), Scopus, Cumulative Index to Nursing and Allied Health Literature (CINAHL), EMBASE and Web of Science. According to the database, descriptors found in the Descriptors in Health Sciences (DeCS) and specific search strategies were used, as described in table 1.

Table 1 – Description of search strategies., 2021.

Database	Strategies
PubMed®/ MEDLINE® and CINAHL	("Critical care" OR "Care, Critical" OR "Care, Intensive" OR "Intensive Care") AND ("Multiple Trauma" OR "Multiple Traumas" OR "Polytrauma" OR "Polytraumas" OR "Trauma, Multiple" OR "Traumas, Multiple") AND ("Pressure Ulcer" OR "Bed Sore" OR "Bed Sores" OR Bedsore OR Bedsores OR "Decubitus Ulcer" OR "Decubitus Ulcers" OR "Pressure Sore" OR "Pressure Sores" OR "Pressure Ulcers" OR "Sore, Bed" OR "Sore, Pressure" OR "Sores, Bed" OR "Sores, Pressure" OR "Ulcer, Decubitus" OR "Ulcer, Pressure" OR "Ulcers, Decubitus" OR "Ulcers, Pressure") AND ("Risk factors" OR "Factor, Risk" OR "Factors, Risk" OR "Risk Factor")
LILACS	("Cuidados Críticos" OR "Cuidado Intensivo" OR "Cuidados Intensivos" OR "Terapia Intensiva") AND ("Traumatismo Múltiple" OR "Lesiones Múltiples" OR "Lesión Multiple" OR "Trauma Múltiple") AND ("Factores de Riesgo" OR "Factor de Riesgo") AND ("Úlcera por Presión" OR Escara OR "Llaga por Presión" OR "Úlcera por Decúbito")
SCOPUS and EMBASE	"Critical Care" AND "Multiple Trauma" AND "Risk factors" AND "Pressure Ulcer"
Web of Science	("Critical Care" AND "Multiple Trauma" AND "Risk factors" AND "Pressure Ulcer")

Source: Own elaboration, 2021

Studies published in Portuguese, English and Spanish were included, without a defined time frame, in scientific journals, available electronically and which also clearly addressed risk factors for the development of PI in their results. Studies that addressed the children and youth population and were not original, such as: literature reviews, editorials, reviews, experience reports, case studies, theoretical reflections, dissertations, theses, monographs and abstracts published in annals of events were excluded.

Studies were collected from selected databases by three independent researchers, previously trained to evaluate titles and abstracts, through a free, single-version online review program: Rayyan Qatar Computing Research Institute (Rayyan QCRI). [12] The Rayyan QCRI helps authors of systematic reviews to perform the categorization of studies, allowing the export of works from a specific database to the program and the exposure of titles and abstracts, with the blinding of the auxiliary researcher, which guarantees reliability in the selection of information, accuracy and methodological precision.

The selection and inclusion of manuscripts were based on the recommendations of the Preferred Reporting Items for Systematic Review and Meta-Analyses – PRISMA. [13] Subsequently, they were classified according to methodology and Level of Evidence, using the Oxford Center for Evidence-Based Medicine classification. [14] In addition, it used a pilot instrument that guided the information to be extracted from the included studies, namely: study location, methodology synthesis, objective, main results and considerations, as shown in table 4.

The methodology was analyzed using assessment instruments from the Joanna Briggs Institute [15] and from the Medical Education Research Study Quality Instrument (MERSQI). [16] The adoption of two different methods expanded the assessment of the quality of the method of each study.

The Joanna Briggs Institute instrument has nine assessment items for quasi-experimental studies. [15] The MERSQI is made up of six domains, which assess and score the following aspects: study design; sample; sample response rate; data type; validity of the assessment instru-

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ment; relationships with other variables; data analysis; and results. [16] The result establishes scores: ≤10 are considered of low quality; >10 to <15 are of moderate quality; and ≥15, high quality. [17]

RESULTS

The selection and inclusion of the works analyzed in this research is shown in Figure 1 according to the PRISMA recommendations (Figure 1). 27 articles were found in the databases, 19 had their titles and abstracts read, 10 were elected for full reading and 3 were included that met all the criteria.

Table 2, below, presents the critical assessment of the methodological quality of quasi-experimental studies, according to the Joanna Briggs Institute's assessment instrument. All the works included in this review had such a methodological design and met most of the items evaluated in the checklist, being considered of good quality.

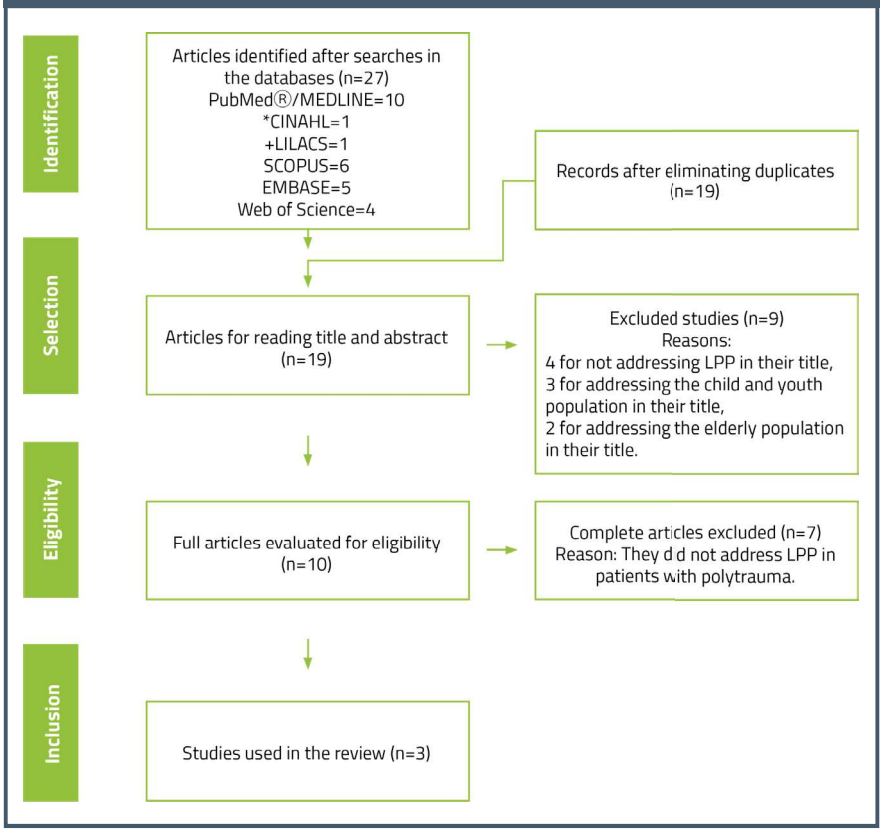
In two of the analyzed articles, a methodological weakness was observed regarding the evaluated criteria and regarding the follow-up of the studied groups, in addition to the fact that, in one of the studies, there was no control group. The MERSQI was used to assess the methodological quality of the studies included in the sample, shown in table 2.

The use of MERSQI made it possible to classify the analyzed studies as having low (n ≤ 10) and medium (10 < n < 15) qualities, with an average score of 11.5. The criteria that gave a low score to the articles were the determination of a single group or the non-randomization of the groups, the use of a single study center and the non-specification of their respective response rates, and non-clarification of the content of the instruments used for data collection.

The characterization and classification of the level of evidence, according to the Oxford Center for Evidence-Based Medicine 14 (2001) is in Table 4. Two studies were in English and one in Spanish.

All studies were international. The

Figure 1 – Flowchart for identification and selection of studies, based on the PRISMA recommendation, 2021



Source: Own elaboration, 2021

Table 2 - Evaluation of quasi-experimental studies included in the review, according to the Joanna Briggs Institute's methodological quality assessment instrument, 2022

Question	Bry, Buescher, Sandrik, 2012[18]	Higgins et al, 2020[19]	López et al, 2015[20]
Is it clear from the study which is the 'cause' and which is the 'effect' (i.e. there is no confusion about which variable comes first)?	Yes	Yes	Yes
Were participants included in similar comparisons?	Yes	Yes	Yes
Were participants included in any comparisons who received similar treatment/care in addition to the exposure or intervention of interest?	Yes	Yes	Yes
Was there a control group?	No	Yes	Yes
Were there multiple outcome measurements before and after the intervention/exposure?	No	Yes	No
Was the follow-up complete and, if not, were the differences between the groups in terms of their follow-up adequately described and analyzed?	No	Yes	No

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authors identified anemia, hypoxemia, immobility, use of vasoactive substances, changes in temperature and nutrition as the main risk factors for pressure injury in patients who had some trauma.

DISCUSSION

The association between multiple trauma and PI brings together two worrying themes of importance to the health area. In 2015, trauma represented 10.1% of the global burden of disease, while the global incidence of PI ranges from 3.3% to 39.3%, depending on the region and the protocols adopted. [6,10]

Despite the growing number of hospitalizations due to trauma and the potential risk for PI involvement in patients in these conditions, there was a scarce number of publications that considered this relationship and approach. [18–20]

The risk factor identified as common to the three studies was hypoxia, sometimes due to hypovolemia or the need for mechanical ventilation. [18–20]

In a study carried out in two hospitals in Mato Grosso do Sul, it was identified that 80.6% of patients who developed PI had impaired tissue perfusion. [21] This is a recognized aggravating factor to the patient's skin integrity and wound healing. [1]

It is possible to relate this issue to another intrinsic factor for the increased risk

Were participant outcomes included in any comparisons measured in the same way?	Yes	Yes	Yes
Were the results measured reliably?	Yes	Yes	Yes
Was appropriate statistical analysis used?	Yes	Yes	Yes

Source: Own elaboration, 2021

Table 3 – Assessment of the methodological quality of the studies, according to the Medical Education Research Study Quality Instrument, 2021.

Domínio	Bry, Buescher, Sandrik, 2012[18]	Higgins et al, 2020[19]	López et al, 2015[20]
Study design	Single group: 1 point	2 groups, non-randomized: 2 points	2 groups, non-randomized: 2 points
Sample (number of centers where the study was performed and level of response)	Single institution: 0.5 point	Single institution: 0.5 point	Single institution: 0.5 point
Type of data/assessment	Objective rating: 2 points	Objective rating: 2 points	Objective rating: 2 points
Validity of the assessment instrument	Internal structure and relationships to other variables, but unreported content: 2 points	Internal structure, content, relationships with other reported variables: 3 points	Internal structure and relationships to other variables, but unreported content: 2 points
Data analysis	Appropriate for study design: 1 point In addition to descriptive analysis: 2 points	Appropriate for study design: 1 point In addition to descriptive analysis: 2 points	Appropriate for study design: 1 point In addition to descriptive analysis: 2 points
Results	Patient/health care: 3 points	Patient/health care: 3 points	Patient/health care: 3 points
Total score	9,5 points	12,5 points	12,5 points

Source: Own elaboration, 2021

Table 4 - Characterization of the studies that made up the sample of this systematic review. Salvador, BA, Brazil, 2021.

Author, year, country	Objective	Method	Result/ Conclusion	Level of evidence
Bry, Buescher, Sandrik, 2012,[18] U.S.A.	To describe the characteristics of patients who developed hospital-acquired pressure ulcers; explore the risk factors of these patients, including comorbidities; and describe measures to reduce risk factors for the development of pressure ulcers acquired in hospitals.	Observational study. The target population included all patients with at least one hospital-acquired pressure ulcer within a 12-month period. Data collection was developed through an instrument developed by the researchers that addressed intrinsic factors, such as medical diagnoses, and extrinsic factors, such as microclimatic factors.	All patients with hospital-acquired pressure ulcers had multiple risk factors, categorized as intrinsic, extrinsic or organ failure, but nearly a quarter were identified by current standards as "low risk". Many of the variables were comorbid diagnoses that are not assessed on the Braden Pressure Injury Risk Scale. Eighty percent of subjects had 6 or more risk factors associated with an increased risk of developing PU (mean 9.2). Two-thirds of the sample group experienced failure of at least one organ system. Data on the use of 5 preventive interventions were computed.	2B

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Higgins et al, 2020,[19] U.S.A.	To compare the predictive properties of Braden and Jackson/Cubbin scales in a trauma-surgical intensive care population.	Observational study. Retrospective review of medical records to extract data from a total of 366 surgical trauma patients at a large trauma center in the southeastern United States. Data were extracted by the Health Services Research Center of the institution under study and were collected within 72 to 96 hours after admission to the ICU.	The sample consisted mainly of middle-aged men (mean [SD], 56 [19] years) (64%) admitted after trauma (71%). Participants who developed pressure injuries were older, required vasopressors and mechanical ventilation more often, and were less mobile. The Jackson/Cubbin scale demonstrated superior predictive properties and discrimination compared to the Braden scale for predicting pressure injury risk in surgical trauma patients.	3B
López et al, 2015,[20] Colombia	To establish, the relationship causes effect of the variables covered in APACHE II and skin care as risk factors for the development of pressure ulcers in critically ill trauma patients.	Cohort study based on a review of clinical histories of critically ill trauma patients who were admitted to two Intensive Care Units in Cali during 2011-2012. The variables studied were pressure ulcers, multiple trauma and APACHE II.	The incidence of pressure ulcer was 53%. There was a statistically significant association between the development of pressure ulcers and changes in temperature, respiratory rate, hypoxemia and serum sodium. Of the 87 patients with APACHE II greater than or equal to 10, pressure ulcer development was 63%.	2B

Fonte: Elaboração Própria, 2021

of PI identified in one of the analyzed studies. Anemia was present in 87.8% of patients with hospital-acquired lesions. [18] In trauma, hemoglobin levels may be altered, especially when there is a loss of blood volume, with a consequent drop or deficiency in tissue oxygenation and impaired healing. [22]

Immobility, the use of vasoactive substances, changes in temperature and the patient's nutritional condition also contribute to a greater risk for PI according to the analyzed manuscripts. [18–20] The patient with multiple traumas groups these characteristics demanding a careful and attentive management given the complexity of many of the cases presented. [23]

Immobility in polytraumatized patients is related both to their clinical condition and to the use of multiple medical devices. [24] A series of instruments that aim to maintain the patient's posture or position, such as cervical collars and splints, are related to PI due to the friction and shear forces exerted by them. [7]

Na Holanda, em um estudo realizado em um centro de trauma, observou-se que 20,1% das LP's em pessoas com trauma espinal foram ocasionadas por dispositivos médicos como os já supracitados, além das máscaras de ventilação não invasiva, cateteres, cânula endotraqueal, entre outros[25]. Estes dispositivos impedem ou dificultam a mobilização do paciente no leito, podendo ainda atuar como pontos de pressão e consequente motivo de lesão[7].

Immobilization of trauma patients, whether or not they are in an Intensive Care Unit (ICU) may also be related to the use of vasoactive or sedative drugs. [21] Such drug therapies were cited in two of the studies analyzed as one of the factors for the involvement of PI. [18–20]

A study carried out at the ICU of a public hospital in João Pessoa showed that hospitalization and the use of vasoactive drugs can contribute to the genesis of PI. In this study, it was observed that 20% of the population studied had lesions associated with the use of these drugs ($p < 0.001$). [26] This relationship can be explained by the mechanism of action of these drugs, such as hypotensive drugs, which reduce blood flow and tissue perfusion or immobilize, such as sedatives. [27] Risk factors for PI already discussed in the present research.

The present review used two instruments to assess the methodological quality of the analyzed studies. The three were considered of good quality in the Joanna Briggs Institute checklist, which showed the absence of multiple measurements of interventions/outcomes as frailty. The multiple measurements are important to verify the proposed intervention as well as its equivalence between the studied groups, being necessary for the validation of the results. [28]

The MERSQI instrument is described as reliable given the rigor of its assessment. [29] This identified weaknesses in the studied sample, such as the execution of studies in a single center/institution and the use of a single group, sometimes not randomized.

Randomization confers veracity on the study, as it has as its fulcrum the comparability between several variables, avoiding selection bias and confounding. Although multicenter trials are considered the gold standard in research because they analyze different populations, reducing the time spent on the experiment, they are costly and complex, justifying the option of many researchers to analyze a single site. [28]

CONCLUSION

Anemia, hypoxemia, immobility, use of vasoactive substances, changes in temperature and nutrition were identified as main risk factors for PI in patients hospitalized for trauma. The study revealed a large gap in the scientific production on risk factors for PI in critically ill polytraumatized patients and was limited to

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not investigating the paid literature, although it did not weaken the findings. However, there is a scarcity of publications focusing on these patients and on the increased risk for skin lesions given the clinical characteristics presented by these patients. Methodological weaknesses were identified in 2 of the 3 selected studies, which reveals the imminent need for research on the topic. The PI is an indicator of the quality of care, and even though it is considered a multidisciplinary approach, good nursing practices directly determine especially strategies and actions for the prevention and control of this complication.

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