

Risk Factors for Pressure Injuries in Stroke Patients: A Systematic Literature Review

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Abstract

Stroke causes weakness in the limbs, which makes stroke patients often fall into bed rest. Continuous pressure on the skin and bone protrusions during bed rest can lead to decreased blood flow, tissue ischemia, and infection, which can result in pressure injury. Bedrest conditions will differ from one disease to another, with the highest incidence in stroke patients. Internal and external factors influence the risk of pressure ulcers and their severity. The study aims to analyze the risk factors for pressure injury in stroke patients. This literature review used two international databases PubMed and Science Direct, and other supporting literature from Google Scholar. The keywords pressure injury, risk factors, and stroke were used. The articles were published between 2016 and 2021. The quality of the articles was examined using the Joanna Briggs Institute Review Instrument. The results show pressure injuries in stroke patients arise from the combined effects of immobility, moisture, compromised nutritional status, and sensory impairment. Prolonged inability to change body position contributes to sustained pressure, reduced tissue perfusion, and increased vulnerability of the skin, while moisture associated with incontinence promotes maceration and disrupts epithelial integrity. Pressure injuries are a serious problem in stroke patients, especially those who are on bed rest. Providing education and counseling, as well as assistance to families, should be carried out, using interesting media and paying attention to every risk factor for pressure injuries.

Keywords: *Immobility; ischemic tissue; pressure injurie;, risk factor; stroke.*

Background

Stroke remains one of the most devastating neurological conditions worldwide, leaving millions of survivors with enduring functional impairments that significantly diminish their quality of life. Among the complications that typically occur during the post-stroke phase, pressure injuries stand out as a subtle but substantial concern that is sometimes overlooked. Prolonged immobility puts constant pressure on sensitive parts of the skin, interrupting blood flow and threatening tissue integrity (Sumah, 2020). Pressure injuries are local injuries to the skin resulting from friction or pressure on the soft tissue between the protruding bones and the surface of the skin for a long time (Riandini et al., 2018). Patients who experience a stroke and weakness in all limbs and are at bed rest are at greater risk of developing pressure injuries (Chayati & Nurachman, 2023; Primalia & Hudiyawati, 2020).

Injuries are an important problem in patients who experience mobility problems (Riandini et al., 2018). Other risk factors for developing pressure injuries in stroke patients include sensory impairment, decreased mobility/movement, decreased activity, friction, and incontinence. Pressure causes circulation in the blood to be obstructed or not smooth, which results in cell death, tissue necrosis, and injuries (Alimansur & Santoso, 2019).

The pooled prevalence of pressure injuries in stroke patients across various studies is approximately 3.9%. In hospital settings, the prevalence of pressure injuries among stroke patients is around 3.06% (Vanaki et al., 2023). A study found a prevalence of 3.3% in a neurological ward, with a significant portion of these injuries being brought from home (Riandini et al., 2018). Another study in a high complexity hospital reported a crude prevalence of 3.97% among all hospitalized patients, with higher rates in ICU and medical-surgical units (Rivera Saba et al., 2024). While in a study focusing on ischemic stroke patients, 25% were found to have pressure injuries (Wong et al., 2025). And another study in a stroke-specialized hospital in Indonesia reported a prevalence of 28% when including Category I pressure injuries and 17% when excluding them (Amir et al., 2013).

Despite the fact that several studies have found risk variables for pressure injuries, there are still few thorough evaluations that summarize these results. The need for more comprehensive, current studies is highlighted by the fact that a large portion of the current research is based on a single database and has a limited publication period (2010–2020). Strengthening and increasing the present database is needed to better understand the multiple risks and to enhance prevention methods for pressure injuries in stroke patients.

Methods

A systematic literature review was conducted from March to May 2023. Two main databases were used, namely PubMed and Science Direct. Additional article searches were also carried out to look for additional literature through official government pages/websites such as the World Health Organization, the Indonesian Ministry of Health, and Google Scholar. The search method utilized specific keywords “risk factor AND vulnerability OR danger OR threat AND pressure injuries OR bed injuries, OR decubitus. Article selection used inclusion criteria including stroke patients in bed rest condition, observational and experimental study, full-text, published 2016-2021, Indonesian and English language, and not a review study.

The steps for selecting and organizing articles were as follows: all relevant articles were selected and analyzed, and then screening was carried out to identify whether there were duplicate articles from the three databases. After the articles containing duplication were removed and placed in a certain folder, the titles and abstracts of these articles were screened to ensure they were appropriate and relevant to be included in the next stage. After that, the full article was read.

All articles included in the literature review have gone through a process of assessing the quality of research methods using the JBI Checklist for Analytical Cross-Sectional Studies, which had eight questions, the JBI Checklist for Quasi-Experimental Studies (non-randomized Experimental Studies), which had nine questions, JBI Critical Appraisal Checklist for Cohort Studies, which had ten questions; and JBI Critical Appraisal Checklist for Case-Control Studies, which had

10 questions. The process of collecting, selecting, and analyzing articles followed PRISMA guidelines. No research ethical feasibility test was carried out as this study was a review of articles and literature that already existed in the journal database.

Results

The search totally resulted 775 articles. After checking for duplication and several screenings, 5 articles were obtained that were suitable for the review (Figure 1).

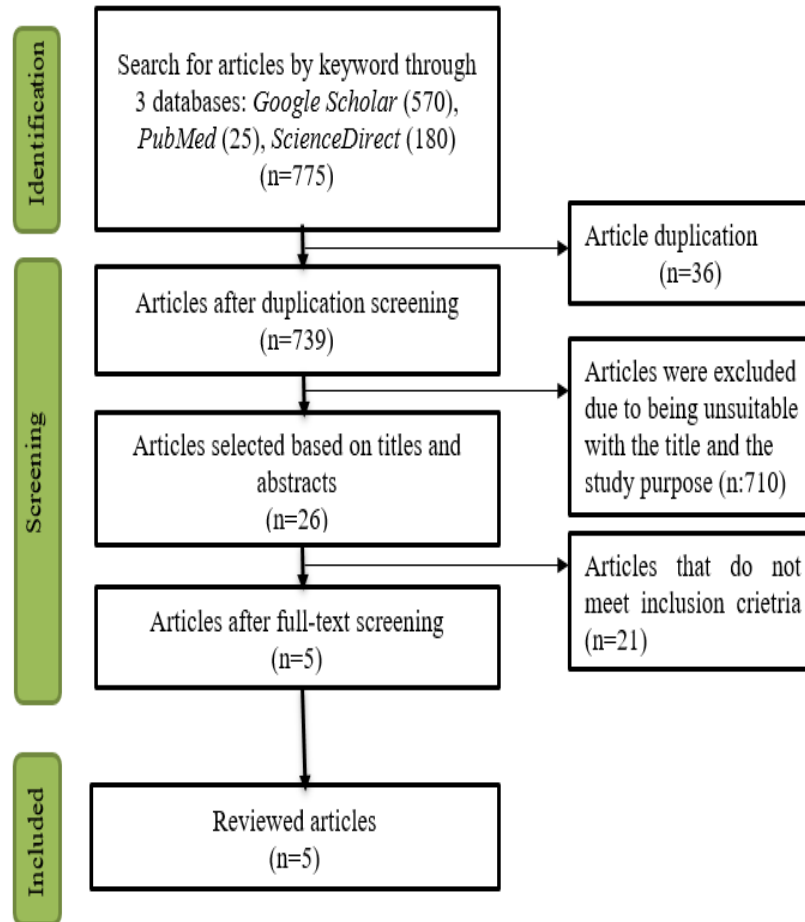


Figure 1. Prisma Diagram

The five selected articles were summarized in table form based on the researcher's name, year, title, research design, place, respondent characteristics, factors influencing pressure injuries, conclusions, and research limitations of the articles (Table 1). The five articles were of moderate quality based on the JBI quality assessment, and all are included in the review

Table 1. Review of the articles

Researchers' name and year	Research design	Place	Respondent characteristics	Key findings	Limitation
(Alimansur & Santoso, 2019)	Cross-Sectional	Inpatient room at Gambiran Kediri Hospital	A total of 40 respondents experienced bed rest for 3 days	The results of this study showed that poor nutritional status, friction, skin moisture, incontinence, mobility or activity, and sensory loss are closely related to the incidence of decubitus. However, a decrease in the level of consciousness is not directly related to the occurrence of decubitus injuries.	Researchers did not explain the sampling frequency of respondents (age, gender).
(Astutik & Huriah, 2017)	Cross-Sectional	Stroke unit at Magelang Regional General Hospital	A total of 49 respondents included 24 males and 25 females in one month at the stroke unit at Tidar Hospital, Magelang.	The results of this study showed that mobility, humidity, shifting, sensory perception, activity, friction and nutrition are the factors that most influence the occurrence of pressure injuries.	This research did not explain the reason why mobility etc., is a trigger factor for pressure injuries.
(Syakura, 2021)	Cross-sectional	Dr. H. Slamet Martodirdjo Hospital Pamekasan.	The respondents were 40 people, patients aged >35 years, and patients in bed rest in the hospital.	The results of this study showed that physical condition, decreased level of consciousness, activity, immobility, and incontinence have a significant influence on the occurrence of pressure injuries	This study did not state how long patients who experienced bed rest or stroke were observed.

Researchers' name and year	Research design	Place	Respondent characteristics	Key findings	Limitation
(Liao et al., 2019)	Multivariate Analysis	Researchers used data from the China Stroke Registry (CNSR) obtained from 132 hospitals in China between September 2007-2008. In the inpatient room	The population included 21.902 patients diagnosed with acute stroke, patients aged >18 years who were treated within 14 days.	The results of this study showed that low haemoglobin, a history of diabetes mellitus, and peripheral vascular disease are associated with the occurrence of pressure injuries in acute ischemic stroke patients.	Researchers only identified the presence of pressure injuries in patients without paying attention to when the injuries developed.
(Schott et al., 2020)	A qualitative approach for longitudinal research	Public hospitals in Brazil from August 2016 to August 2017. The room is not mentioned.	This study used a population sample of 46 inpatients aged 18-60 years, with 32 male respondents and 18 female respondents, patients with acute ischemic stroke.	The results of this study showed a close relationship between predisposing factors such as BMI, poor diet acceptance, immobility, and anemia and the occurrence of pressure injuries in stroke patients.	Researchers did not include the prevalence of pressure injuries for each factor.

Discussion

Dominant factors, immobility and nutritional status, are the major risk factors in the occurrence of pressure injuries in stroke patients. Mobility is the ability to control body position, while activity is the ability to move. Patients who continuously lie down without being able to change position are at high risk for disruption of blood circulation and skin integrity (Alimansur, M., & Santoso, 2021; Mahmuda, 2019; Riandini et al., 2018). In bed rest status, patients were unable to control urination and defecation, causing erosion or abrasions on the patient's skin (Syakura, 2021). It will cause dampness of the patient's skin (Atmojo, 2020; Primalia & Hudiyawati, 2020) and increase skin humidity, leading to the development of chronic injuries by softening the top layer of skin (maceration) and changing the chemical environment of the skin (Alimansur & Santoso, 2019). In a previous study, it was concluded that around 81.2% of patients experienced pressure injuries due to skin moisture (Setiani & Imamah, 2019). This caused the skin to experience friction easily (Mahmuda, 2019).

Friction can affect the local capillary layer, contribute to tissue hypoxia, and disrupt blood flow by compressing blood vessels trapped between the skin and bones (Amirsyah et al., 2020). The patient's body tends downwards due to the influence of gravity, leading to a downward movement, which causes friction. Continuous friction resulting in pressure injuries formation (Alimansur, M., & Santoso, 2021). However, recent research indicates that friction primarily contributes to superficial skin lesions rather than deeper tissue injuries (Brienza et al., 2015; Lahmann & Kottner, 2011). Frictional forces tend to cause superficial skin lesions resembling category II pressure ulcers, while pressure and shear forces are more responsible for deeper tissue injuries leading to category III or IV pressure ulcers (Lahmann & Kottner, 2011).

Furthermore, patients with malnutrition and low albumin levels are at very high risk of developing pressure injuries (Alimansur & Santoso, 2019). Even inadequate nutrition delays healing due to decreased fibroblast production, neoangiogenesis, and collagen synthesis in addition to very low tissue remodeling capacity (Schott et al., 2020). Because nutrition rich in protein plays a role in tissue regeneration, the immune system, and inflammatory reactions. A lack of protein increases the tendency toward edema, which interferes with the transport of oxygen and other nutrients to tissues. Besides protein, vitamins also play a crucial role. Vitamin A is also known to play a role in maintaining epithelial integrity, collagen synthesis, and infection protection mechanisms. Vitamin C plays a role in collagen synthesis and immune system function, so that a lack of vitamin C can cause blood vessels to become easily damaged (fragile) (Labeau et al., 2021).

Nutrition also plays in hemoglobin and hematocrit production. Red blood cell deficiency resulted decrease in hemoglobin. It's also induced inflammatory cytokines, caused by lesions on erythroid progenitor cells. This condition limits patient mobility and disrupts blood circulation, reducing the transport of oxygen and nutrients to the wound. Some nutritional deficiencies, such as iron, vitamin B12, and folate, may also cause anemia and have a negative impact on pressure ulcer healing (Tuz & Mitchell, 2021). Indeed, malnutrition is one of the significant factors that can increase the risk of pressure injuries. Poor nutritional intake and low body weight are significant risk factors, as they impair skin integrity and the body's ability to heal (Edlich et al., 2004; Reddy, 2022; Williams, 2024).

Another factor that contributes to the development of pressure injury in bedrest conditions is sensory loss and unconscious state (Syakura, 2021). Individuals with sensory deficits, such as those with spinal cord injuries (SCI), are at a higher risk of developing pressure injuries. Sensory dysfunction can alter proprioception and the ability to react to environmental stimuli like pain and temperature, making it difficult for individuals to recognize and respond to prolonged pressure (Bogie & Bader, 2005; Edlich et al., 2004; Harper et al., 2021). The American Spinal Injuries Association (ASIA) impairment score, which assesses the neurological level of injury and functional ability, indicates that individuals with greater sensory and motor loss have an increased risk of developing additional pressure injuries compared to those with less impairment (Bogie & Bader, 2005; Edlich et al., 2004). The development of pressure injuries in individuals with altered consciousness is multifactorial, involving immobility, sensory dysfunction, neurological impairments, systemic conditions, and mechanical factors (Bogie & Bader, 2005; Edlich et al., 2004; Harper et al., 2021).

Conclusion

Pressure injuries in stroke patients are primarily caused by immobility, dampness, poor nutrition, and sensory impairment. Prolonged inability to reposition causes persistent pressure and decreased tissue circulation, whereas wetness from incontinence promotes maceration and impairs epidermal integrity. Nutritional shortages impair collagen synthesis, immunological function, and tissue regeneration, increasing sensitivity to damage, while sensory loss or altered consciousness lowers patients' capacity to notice or respond to harmful pressure. Collectively, these characteristics highlight immobility, wetness, starvation, and sensory dysfunction as the primary causes of pressure injuries in stroke patients. To effectively prevent pressure injuries and improve patient outcomes, clinical practices like nurses should prioritize early mobilization, routine repositioning schedules, comprehensive moisture management, nutritional screening and supplementation, and regular neurological assessments.

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