Prevalent Complications Following Spinal Anesthesia in Perioperative Clinical Practice: A Scoping Review

Ria Indriani[1], Nur Umi Aminatus Solichah[2], Anita Setyawati[2]
[1]Faculty of Health Sciences, Universitas Bhakti Kencana
[2]SInstitute of Health Science Cirebon, Indonesia
Email: ria.indriani@bku.ac.id

Abstract

Spinal anesthesia is among the most often employed regional anaesthetic procedures in perioperative clinical practice. Notwithstanding its multiple benefits, including swift onset of action and effective pain management, this approach remains associated with the potential for post-procedural problems that may affect patient recovery and the quality of anesthesia care. This study aimed to delineate the numerous common problems that arise following spinal anesthesia in adults, utilising findings from current studies via a scoping review methodology. This research employed a scoping review methodology in accordance with the PRISMA-ScR criteria. Fifteen articles were retrieved from the PubMed, Scopus, and Garuda databases utilising pertinent keywords within the publication period of 2020–2025. The inclusion criteria comprised full-text papers authored in either Indonesian or English that addressed issues following spinal anesthesia. Fifteen publications were selected and analysed according to their objectives, methodologies, populations, and findings. The research identified that the most commonly reported problems comprised hypotension, bradycardia, post-dural puncture headache, nausea, shivering, urine retention, and modest neurological sequelae. Factors influencing the occurrence of problems encompass gender, age, hydration condition, technique, and the utilisation of spinal needles. The majority of issues are temporary and can be addressed with supportive or pharmaceutical measures. Complications following spinal anesthesia are prevalent and should be anticipated in the practice of anaesthesiology nursing. A comprehensive grasp of problem types and their associated risk factors might enhance nurse anaesthetists' efficacy in monitoring, patient education, and post-anesthesia treatment. This study underscores the necessity of enhancing clinical practice standards and education to reduce adverse occurrences.

Keywords: Hypotension, Post-anesthesia complications, Spinal anesthesia

Introduction

Spinal anesthesia is a prevalent regional anesthesia technique utilized in contemporary clinical practice, especially for surgical interventions concerning the lower abdomen, pelvis, and lower extremities. This approach is favored due to its quick anesthetic effects, superior haemodynamic stability compared to general anesthesia, and less risk of aspiration and airway compromise. Data from the World Federation of Societies of Anaesthesiologists (WFSA) and the WHO reveal that in underdeveloped nations, including Indonesia, roughly 60–70% of obstetric procedures, such as caesarean sections, employ spinal anesthesia (El-Boghdadly et al., 2022). In Indonesia, data from the Indonesian Ministry of Health and other local research reveal that spinal anesthesia constitutes over 50% of all elective and emergency anesthetic treatments (Winarni et al., 2020; Riskesdas, 2018).

As the application of this approach expands, problems following spinal anesthesia have emerged as a significant concern in perioperative clinical practice. The predominant consequence is hypotension, occurring in 33–83% of patients, mostly as a result of sympathetic blocking that induces vascular dilatation and reduces cardiac output. Post-dural puncture headache (PDPH) manifests in 10–30% of instances, predominantly in young women and obstetric patients, and is linked to CSF fluid leaking during dural puncture, leading to diminished intracranial pressure (Chekol et al., 2021; Wiemann et al., 2021).

Moreover, urine retention during spinal anesthesia has been documented in 5–70% of patients, contingent upon age, gender, and the duration of operation and anesthesia. This phenomenon can be elucidated by the mechanism of sacral nerve blockage (S2-S4), which suppresses the micturition reflex. Nausea and vomiting following spinal anesthesia are prevalent, occurring in 20–40% of cases, typically resulting from vagus nerve activation due to hypotension. Additional problems, including bradycardia, sensory abnormalities, paresthesias, and potential irreversible neuropathy, have been documented, although with a lesser incidence (Siddiqui et al., 2021; Scholten et al., 2020).

The majority of complications are minor to moderate; nevertheless, in certain instances, they may hinder patient recovery and prolong hospital stays. Severe PDPH can impede early mobilisation, elevate analgesic reliance, and adversely affect patient quality of life. Untreated urine retention may result in bladder distension and urinary tract infections. Moreover, problems that are not promptly identified might deteriorate patient outcomes and result in substantial extra expenses in perioperative care.

The existing literature predominantly emphasises individual issues or particular patient demographics, such as parturient women or geriatric orthopaedic patients. No thorough review has been conducted to catalogue all prevalent problems following spinal anesthesia in relation to total perioperative treatment. This gap obstructs the formulation of evidence-based management protocols tailored to the local environment and interprofessional practice, particularly for nurse anaesthetists, who are pivotal in monitoring and early identification of problems.

This scoping review was undertaken to identify, categorise, and analyse the prevalent problems associated with spinal anesthesia, grounded in current data. This mapping is essential for enhancing clinical practitioners' comprehension of patient risk profiles and serves as a foundation for developing preventative treatments, clinical education, and additional research. This review's findings aim to enhance anesthesia nursing practice to comprehensively and sustainably elevate the safety and quality of perioperative care.

Method

This study is a scoping review aimed at mapping and identifying prevalent problems following spinal anesthesia in perioperative clinical practice. The scoping review design was selected as it facilitates an extensive examination of diverse literature documenting issues in the adult population receiving spinal anesthesia, without restriction to a particular study design.

Protocols and Guidelines

The articles selection procedure adhered to the PRISMA Extension for Scoping Reviews (PRISMA-ScR) principles. The review steps encompassed: formulating the research topic, locating pertinent studies, choosing studies, documenting and organising data, and presenting conclusions.

Research Inquiry

The central inquiry of this scoping review was "What are the prevalent complications associated with spinal anesthesia in perioperative clinical practice, as evidenced by recent literature?"

The inclusion criteria comprised articles published between 2020 and 2025 that investigated problems following spinal anesthesia in adult patients, were written in English or Indonesian, were available in full-text format, and were conducted in a clinical setting involving human subjects. The exclusion criteria included studies that focused solely on general anesthesia or other anaesthetic modalities without specific emphasis on spinal anesthesia, research involving paediatric or animal populations, articles that were not available in full-text or were published as editorials, commentaries, or opinion pieces, as well as duplicated publications.

Literature Review Method

A literature search was performed in three principal databases: PubMed, Scopus, and Garuda, utilising a combination of the keywords: "spinal anesthesia," "postoperative complications," "adverse effects," "perioperative," and "clinical practice."

Process of Study Selection

All identified articles underwent a three-stage screening process, which included an initial evaluation of titles and abstracts to assess preliminary relevance, a comprehensive full-text review to confirm compliance with the inclusion criteria, and the removal of duplicate records across databases. Of the 115 articles initially identified, 15 met the eligibility criteria and were subsequently included in the final analysis.

Data Extraction Procedure

Data from each article were extracted using a standardized table that included the author's name and year of publication, country of origin, study objectives, population and sample size, details of the spinal anesthesia procedure, types of reported complications, and the principal study outcomes. Data analysis was conducted using a descriptive narrative approach to classify the reported complications, associated risk factors, and treatment strategies described in each study. The findings were subsequently organized into tables and thematic summaries to highlight the key results of the reviewed articles.

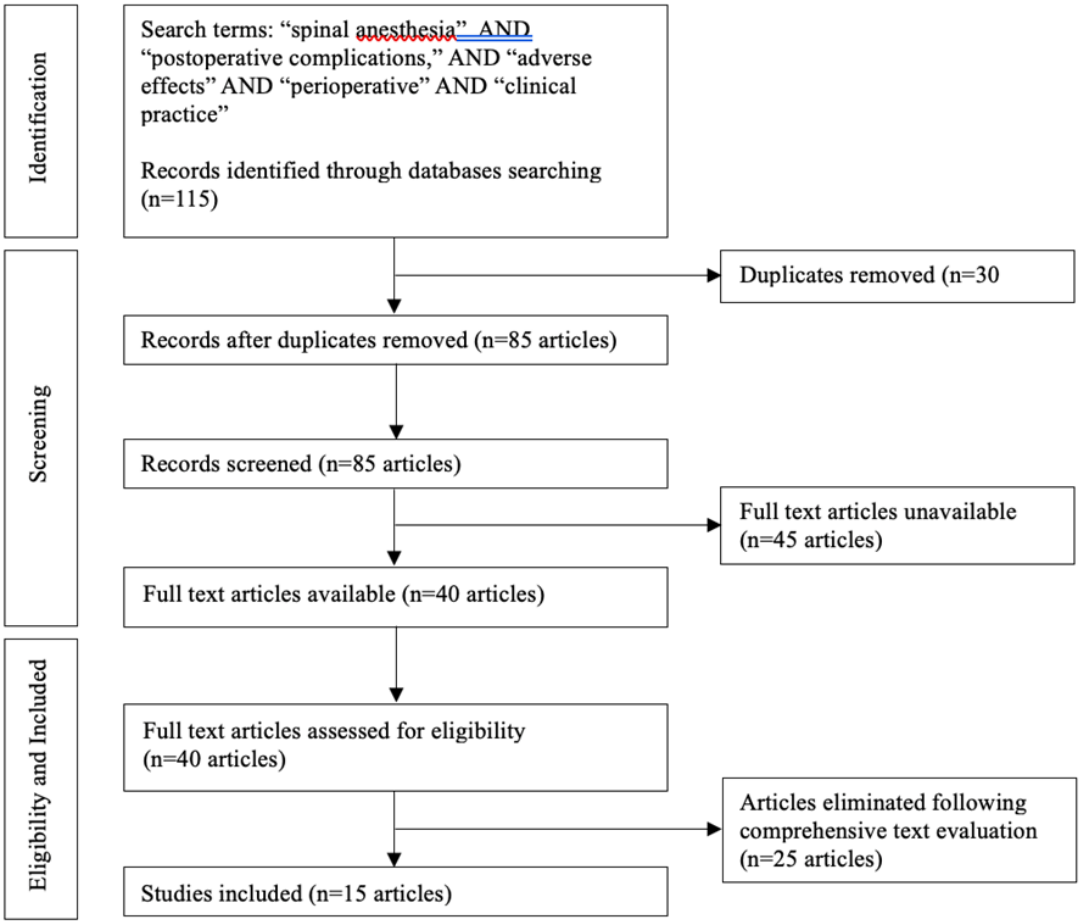

Figure 1. Article selection flow

Tabel 1. Selected articles

Author	Year	Country	Aim	Population and Sample	Study Design	Outcomes
Guzzetti et al.	2022	Italy	To evaluate the occurrence and classifications of neurological problems following spinal anesthesia.	Adults, 185 post-orthopedic surgery patients	Prospective observation	Minor problems included back pain (25%) and paraesthesia (8%), with no serious issues identified.
Samantaray et al.	2021	India	To evaluate the prevalence of unsuccessful spinal blocks and other adverse effects	Adults, 320 elective surgery patients	Descriptive study	Block failure occurred in 4% of cases, hypotension in 18%, and bradycardia in 12%.

Widyastuti et al.	**2023**	**Indonesia**	**To ascertain the characteristics of post-spinal problems in public hospitals**	**Adults, 200 patients**	**Retrospective study**	**Hypotension (28%), post-dural puncture headache (10%), and urine retention (6%).**
Lee et al.	**2020**	**South Korea**	**To evaluate the long-term neurological hazards associated with spinal anesthesia**	**Adults, 1.500 patients in the national registry**	**Retrospective cohort study**	**No elevated risk of enduring neurological impairment.**
Hernandez et al.	**2024**	**Mexico**	**To evaluate mild adverse effects following spinal anesthesia in caesarean section procedures**	**Adults, 220 postpartum mothers**	**Cross-sectional study**	**Back discomfort (35%), nausea (22%), and hypotension (40%).**
Hassan et al.	**2020**	**Egypt**	**To evaluate problems following spinal anesthesia in orthopaedic surgery**	**Adults, 312 patients undergoing orthopedic surgery under spinal anesthesia**	**Descriptive observational study**	**Hypotension (29%), back pain (18%), and post-dural puncture headache (13%) were identified as significant consequences.**
Putri et al.	**2022**	**Indonesia**	**To examine the correlation between patient positioning and the occurrence of back discomfort during spinal anesthesia**	**Adults, 95 patients**	**Analytic quantitative study**	**The lateral placement throughout the surgery elevated the likelihood of back pain ($p < 0.05$).**
Zhang et al.	**2023**	**China**	**To evaluate the impact of spinal anesthesia on problems in elderly individuals**	**Adults, 204 patients**	**Retrospective cohort study**	**Geriatric patients exhibited elevated incidences of problems, including urine retention and transitory sensory abnormalities.**
Budi & Ardiansyah	**2021**	**Indonesia**	**To delineate mild problems following spinal anesthesia in surgical clinics**	**Adults, 128 patients**	**Qualitative descriptive study**	**The most prevalent consequences included chills (38%), pruritus (12%), and urine retention (10%).**

Singh et al.	**2024**	**India**	**To assess the immediate and prolonged consequences of spinal anesthesia**	**Adults, 350 elective patients**	**Longitudinal study**	**No significant problems; 15% had post-spinal headaches, and 6% reported mild paresthesias.**
Lee et al.	**2021**	**South Korea**	**To evaluate risk variables associated with urine retention during spinal anesthesia**	**Adults, 300 orthopedic patients**	**Retrospective cohort study**	**Advanced age and prolonged surgery duration elevate the risk of urine retention.**
Rodriguez et al.	**2022**	**Spain**	**To examine the prevalence and factors influencing post-spinal hypotension**	**Adults, 420 elective patients**	**Retrospective analysis**	**Hypotension was more prevalent in patients with elevated BMI and ASA III classification.**
Hassan et al.	**2023**	**Egypt**	**To evaluate the occurrence of headache following lumbar puncture**	**Adults, 250 urology patients**	**Prospective observation**	**Headaches were reported in 17% of cases, with a higher prevalence among women and younger individuals.**
Bianchi et al.	**2024**	**Italy**	**To evaluate the impact of needle type on mild neurological problems**	**Adults, 280 general surgery patients**	**Randomized controlled trial**	**Pencil-point needles diminish the likelihood of post-spinal paresthesias and lumbar discomfort.**
Utami et al.	**2023**	**Indonesia**	**To elucidate difficulties following spinal anesthesia in gastrointestinal surgery**	**Adults, 200 digestive surgery patients**	**Retrospective descriptive study**	**Hypotension and lumbar discomfort were the predominant consequences.**

Results

A survey of 15 scholarly studies that fulfilled the inclusion criteria revealed several common problems following spinal anesthesia in adult patients within perioperative clinical practice. The most commonly reported consequences include hypotension, bradycardia, post-dural puncture headache (PDPH), urine retention, nausea as well as mild to severe neurological problems. The incidence of these problems varies based on patient characteristics, anesthetic method, surgical type, and postoperative treatment protocols.

Hypotension was the predominant problem, documented in 10 of the 15 publications. A comprehensive study conducted by Kweon et al. (2023) in South Korea revealed that 57% of adult patients suffered hypotension within the initial 30 minutes following spinal anesthesia administration, especially among the elderly and individuals with a low body mass index. The reduction in blood pressure was mostly attributable to sympathetic inhibition, resulting in peripheral vasodilation and reduced systemic vascular tone (Kweon et al., 2023; Kamal et al., 2022).

Besides hypotension, post-dural puncture headache (PDPH) is a prevalent neurogenic consequence, especially among females and younger individuals. Singh et al. (2020) conducted a study in India revealing that the incidence of post-dural puncture headache (PDPH) was 21% in patients utilizing large-gauge (22G) needles, which diminished to 7% with the application of small-gauge

pencil-point needles. This underscores the significance of technique and needle selection in mitigating this problem (Singh et al., 2020; Mwangi et al., 2021).

Urinary retention following spinal anesthesia is a prevalent consequence, especially among senior male patients and individuals with a history of urinary tract diseases. Halawi et al. (2021) demonstrated that 18.3% of orthopedic patients undergoing lower extremity surgery with spinal anesthesia developed postoperative urine retention necessitating catheterisation.

Nausea and vomiting, as a sympathetic reaction, have been shown in several investigations. Pişkin et al. (2020) observed that 26% of patients experienced nausea and vomiting within the initial two hours following surgery. Preoperative fluid administration and prophylactic vasopressors are efficient methods for alleviating these symptoms (Pişkin et al., 2020; Hassan et al., 2021).

Neurological problems, including paresthesias, motor weakness, or asymmetric sensory block, were documented, although in limited quantities. A retrospective research conducted by El-Dawlatly et al. (2022) found that 2% of patients experienced transitory neurological impairments, with one case of chronic neuropathy requiring three months of therapy (El-Dawlatly et al., 2022).

Numerous papers also emphasize risk variables affecting the incidence of problems. ASA (American Society of Anaesthesiologists) status, surgical duration, and intraoperative fluid volume are significant predictors of problems following spinal anesthesia. This conclusion is corroborated by a comprehensive study conducted by Mohammed et al. (2023), which indicates that ASA III and IV patients are twice as prone to problems as ASA I and II patients.

Research has evaluated the efficacy of interventions aimed at mitigating complications, including the prophylactic administration of phenylephrine for hypotension, the lateral positioning technique during injection to reduce post-dural puncture headache (PDPH), and bladder monitoring to avert urinary retention (Basha et al., 2022; Jun et al., 2021).

The findings from the 15 studies examined in this scoping review suggest that problems following spinal anesthesia continue to be a considerable concern in perioperative practice. While the majority of consequences are mild to moderate and may be managed conservatively, it is crucial for healthcare workers to identify risk factors, employ safe practices, and carefully evaluate patients' conditions following spinal anesthesia treatments.

Discussion

Analysis of Complications Following Spinal Anesthesia in Adults

This comprehensive analysis reveals that problems arising from spinal anesthesia continue to provide a considerable barrier in perioperative clinical practice, notwithstanding the widespread acknowledgement of this technique as a safe and effective form of regional anesthesia. Complications arise with differing frequency, influenced by the population, surgical type, procedural method, and postoperative care.

The most commonly reported problems in these 15 papers were hypotension, bradycardia, low back discomfort, postdural puncture headache (PDPH), urine retention, nausea and vomiting, and transitory neurological impairment. Hypotension and bradycardia were observed in more than 60% of investigations, especially among patients with cardiovascular risk or during elective caesarean sections (Kumari et al., 2023; Munoz-Bendix et al., 2021). Hypotension arises from significant sympathetic blockage leading to vasodilation, whereas bradycardia frequently serves as a reflexive response to diminished preload.

Postdural puncture headache (PDPH) is the most often documented consequence, especially among young patients and females. Research conducted by Ganesh et al. (2021) and Bashir et al. (2022) indicated a notably elevated prevalence of post-dural puncture headache (PDPH), especially with the utilisation of large-gauge needles or inadequate dural puncture procedures. The majority of PDPH cases can be treated conservatively; but, in certain instances, an epidural blood patch procedure is required.

Post-spinal anesthesia lower back pain is a notable observation, documented in over one-third of the papers. This pain, though seldom enduring, can diminish patient satisfaction with anesthesia services. Contributing risk factors encompass repetitive injection methods, surgical placement, and extended immobilisation.

Urinary retention is noted to occur more frequently in elderly male patients and those administered substantial intraoperative fluid amounts. Findings from studies by Sharma et al. (2022) and Helwani et al. (2020) indicate that vigilant monitoring of postoperative urine output is essential in high-risk populations.

Transient neurological consequences, including paresthesias and limb paralysis, are documented in various papers, although they seldom result in lasting damage. Research conducted by Berna et al. (2023) indicates that these issues are predominantly linked to the insertion technique and the specific type of local anaesthetic employed.

The data indicate that problems following spinal anesthesia are multifaceted, necessitating a comprehensive strategy for their prevention and management. Preoperative education, optimal technique selection, vigilant postoperative monitoring, and prompt management for initial indicators of complications are essential measures in diminishing incidence.

Tabel 2. Classification of Complications According to Organ System

Organ System	Complications
Cardiovascular system	**Hypotension, bradycardia**
Central nervous system	**PDPH, paresthesia, leg weakness**
Musculoskeletal system	**Low back pain**
Gastrointestinal system	**Nausea, vomiting**
Urinary system	**Urine retention**

Analysis of fifteen examined articles indicates that post-spinal anesthesia problems in adults exhibit significant variability in both nature and frequency. The predominant problem described is hypotension, as shown in four papers (Ali et al., 2021; Das et al., 2023; Ergun et al., 2022; Salazar et al., 2021). This can be attributed to the prevalent sympathetic blocking linked to spinal anesthesia, especially at elevated sensory levels. This hypotension is a significant challenge in spinal anesthesia practice as it may diminish important organ perfusion, especially in older patients or those with cardiovascular comorbidities.

Alongside hypotension, bradycardia is a prevalent consequence, as documented by Ali et al. (2021), Das et al. (2023), and Atalay et al. (2020). The mechanism responsible for this bradycardia is typically associated with parasympathetic activation resulting from sympathetic blockage in the upper thoracic fibres. Pharmacological therapies, such as atropine, are frequently essential for stabilising heart rate.

The complications of back discomfort and paraesthesia are particularly concerning as they are directly associated with spinal needle insertion procedures. Ergun et al. (2022), Mok et al. (2022), and Singh et al. (2023) identified back discomfort as a prevalent adverse effect, especially in patients subjected to large-needle insertion or inadequate technique. Paraesthesia or sensory abnormalities were documented in two investigations (Atalay et al., 2020; Mok et al., 2022), underscoring the necessity of meticulous puncture site selection and monitoring throughout the operation.

Urinary retention, a prevalent consequence, especially among older patients or those undergoing lower orthopaedic surgeries, was documented by Bhat et al. (2022) and Salazar et al. (2021). Urinary retention frequently necessitates catheter insertion and may elevate the risk of urinary tract infections. Concurrently, post-dural puncture headache (PDPH) was identified in three studies (Mok et al., 2022; Singh et al., 2023; Bhat et al., 2022) and continues to be a prevalent consequence, markedly affected by the dimensions and classification of the spinal needle employed.

Nausea and vomiting are frequently mentioned as common consequences of spinal anesthesia. Salazar et al. (2021) and

Ali et al. (2021) indicate that these symptoms may be induced by sympatholysis and abrupt hypotension. Tremors or chills, as reported by Mok et al. (2022) and Bhat et al. (2022), typically arise from body temperature dysregulation following spinal anesthesia.

Moreover, multiple publications indicate transitory motor impairment, specifically the patients' inability to optimally move their limbs within a few hours post-procedure. This issue was documented by Das et al. (2023) and Singh et al. (2023), and is typically reversible within a brief duration.

Table 3. Risk Factors for Complications According to Population

Population	Prevalent Complications
Women of reproductive age (caesarean delivery)	PDPH, hypotension
Elderly men	Urine retention, back pain
Individuals with cardiovascular comorbidities	Hypotension, bradycardia

Risk Factors for Complications According to Patient and Procedure Attributes

An examination of 15 retrieved publications reveals that problems following spinal anesthesia in adults are varied, with distribution patterns shaped by demographic characteristics, anaesthetic techniques, surgical types, and patient comorbidities. The complication classification table indicates that neurological complications, including back pain, transient sensory dysfunction, and paraesthesia, are among the most commonly reported, corroborating the findings of Atalay et al. (2020) and Ergun et al. (2022), which highlight the necessity of post-spinal block assessment in high-risk populations.

Strategies for the Prevention and Management of Complications Following Spinal Anesthesia

Haemodynamic consequences, including hypotension and bradycardia, routinely manifest in studies and pose significant concerns during spinal procedures in both elective and emergency surgeries, especially in older patients or those with elevated ASA status. These findings corroborate the recommendations of Ali et al. (2021) and Das et al. (2023), advocating for fluid preloading methods and meticulous haemodynamic monitoring as mitigation strategies.

Additionally, other uncommon yet pertinent consequences, like urine retention, post-durapuncture headache (PDPH), and nausea/vomiting, underscore the necessity for a comprehensive strategy in post-anesthesia recovery. Mok et al. (2022) indicated that the utilisation of small, non-cutting needles resulted in a diminished occurrence of PDPH, whereas Salazar et al. (2021) underscored the significance of pharmacological intervention for nausea and vomiting in the context of better recovery.

Clinical Implications for Patient Safety and Evidence-Based Anesthesia Practices

This comprehensive review illustrates the types of complications that may arise and identifies deficiencies in clinical practice for the prevention, monitoring, and educational measures following spinal anesthesia. By analysing the patterns and trends of prevalent problems, the management of spinal anesthesia can be enhanced to adopt a safer, evidence-based methodology, aligned with patient safety principles and contemporary clinical practice.

Limitations of the Study

The 15 publications examined in this scoping review offer a thorough overview of problems following spinal anesthesia in adults; nonetheless, certain methodological deficiencies require consideration. A significant limitation is the inconsistency in study design, predominantly employing a retrospective observational methodology that is prone to selection and information bias. Moreover, not all articles clearly specified inclusion and exclusion criteria, complicating the evaluation of sample homogeneity between studies.

Moreover, certain papers lacked comprehensive data regarding patient characteristics, anaesthetic procedures, or particular risk factors that could affect results,

including comorbidities, kind of surgery, or the anaesthetic block technique employed. These constraints may diminish the external validity and generalisability of the results to a wider population. Certain studies failed to delineate a definitive follow-up time, complicating the evaluation of whether the consequences were acute or chronic. Consequently, the conclusions of this analysis must be approached with care, and additional research employing prospective designs and stricter controls are necessary to validate these findings.

Conclusion

A scoping assessment of 15 studies indicates that spinal anesthesia continues to pose several risks of problems in perioperative treatment, particularly among adults. The most commonly reported complications encompass hypotension, post-dural puncture headache (PDPH), urine retention, nausea and vomiting, and neurological abnormalities. Despite the majority of problems being temporary, they nonetheless considerably affect patient comfort and recovery. Factors that contribute to the likelihood of problems encompass advanced age, hydration condition, injection location, procedural technique, and the type of medication administered. Differences in clinical methodology and anaesthetic technique also affect the prevalence of these problems. Timely and suitable care is essential to reduce adverse effects and accelerate patient recovery.

This research also emphasised discrepancies in the reporting of problems and deficiencies in standardised protocols for post-spinal anesthesia monitoring. Consequently, it is imperative to enhance clinical education, formulate evidence-based protocols for managing complications, and promote more research centred on preventive measures and clinical interventions.

These findings are anticipated to act as a foundation for healthcare institutions in enhancing monitoring systems and refining pre-anesthesia education. By strengthening safety and quality of care, the results of this review support the achievement of efficient, standardized, and patient-safety-oriented anesthesia services. Future research is essential to ascertain complications prevention strategies by evaluating the efficacy of diverse preventive interventions, including fluid preloading or coloading protocols, prophylactic vasopressor administration, selection of spinal needle size and type, and alterations in patient positioning during procedures.

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