

INCIDENCE OF POST DURAL PUNCTURE HEADACHE FOLLOWING DIAGNOSTIC/THERAPEUTIC LUMBAR PUNCTURE USING 25 GAUGE QUINCKE SPINAL NEEDLE: A DESCRIPTIVE CROSS-SECTIONAL STUDY

Original Research

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ABSTRACT

Background: Post-dural puncture headache (PDPH) remains a common complication following spinal anesthesia. Needle design and patient-related factors significantly influence its incidence.

Objective: To determine the incidence of PDPH following lower-segment surgeries performed under spinal anesthesia using a 25-gauge Quincke spinal needle and to evaluate its association with age, gender, number of attempts, and patient positioning during lumbar puncture.

Methods: This descriptive cross-sectional study was conducted from August to November 2024 and included 319 ASA I–II patients undergoing gynecologic, urologic, and orthopedic lower-segment surgeries under spinal anesthesia. Patients were monitored for three days postoperatively. The onset, location, and severity of headache were recorded using a structured questionnaire.

Results: The overall incidence of PDPH was 20.6% (66/319). A higher incidence was observed in younger patients. Among patients aged 15–30 years (n=158), 38 (57.6% of total PDPH cases) developed PDPH. In the 31–45 years group (n=103), 21 (31.8%) were affected, while only 7 patients (10.6%) in the 46–60 years group (n=58) developed PDPH. PDPH was more frequently observed in younger female patients undergoing gynecologic procedures.

Conclusion: The incidence of PDPH with a 25-gauge Quincke spinal needle remains considerable, particularly among younger patients. Careful consideration of needle type, size, and procedural technique may help reduce the occurrence of this complication.

Keywords: Post-dural puncture headache, Quincke spinal needle, spinal anesthesia, lumbar puncture, cerebrospinal fluid leakage.

Incidence of Post-Dural Puncture Headache (PDPH) Following Spinal Anesthesia with 25-G Quincke Needle

STUDY DESIGN

Descriptive Cross-Sectional Study

- 319 Patients
- Aug - Nov 2024



LOWER-SEGMENT SURGERIES



Gynecologic



Urologic



Orthopedic



20.6%

66 out of
319 Patients

Higher Incidence in Younger Patients

Age 15-30:

57.6% (38 cases)



Age 31-45:

31.8% (21 cases)



Age 46-60:

10.6% (7 cases)

25G QUINCKE SPINAL NEEDLE

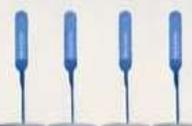


25-Gauge Spinal Needle

RISK FACTORS



Female Gender



Multiple Attempts



Young Age



Patient Positioning

CONCLUSION

PDPH with a 25-G Quincke needle is common, especially in younger patients.
Careful technique can help reduce the risk.

Keywords: Post-Dural Puncture Headache, Quincke Needle, Spinal Anesthesia, Lumbar Puncture

INTRODUCTION

Spinal anesthesia is a widely used and effective regional anesthetic technique that involves the injection of a small volume of local anesthetic into the subarachnoid space. It provides rapid onset, dense neural blockades, and is generally considered safe with a low incidence of life-threatening complications. However, post-dural puncture headache (PDPH) remains one of its most common adverse effects (1).

PDPH typically presents as a postural headache that worsens in the upright position and improves on lying supine (2). It usually develops within 48 hours following dural puncture. Associated symptoms may include nausea, vomiting, photophobia, diplopia, tinnitus, and neck stiffness. The International Headache Society defines PDPH as a headache occurring within five days of dural puncture and characterized by a postural component (3). The pathophysiology of PDPH is primarily attributed to cerebrospinal fluid (CSF) leakage through the dural defect, leading to decreased CSF pressure. This results in traction on pain-sensitive intracranial structures and compensatory cerebral vasodilation, both contributing to headache development (4).

Several risk factors influence the occurrence of PDPH. Patient-related factors include younger age, female gender, pregnancy, low body mass index, prior history of headache or PDPH, and multiple puncture attempts (5). Procedure-related factors include needle size, needle tip design (cutting vs. non-cutting), bevel orientation, and number of lumbar punctures. The diameter and design of the spinal needle are considered the most critical determinants of PDPH incidence (6). Historically, the use of large cutting needles (e.g., 16–22 gauge) was associated with a very high incidence of PDPH, reaching up to 80% in early reports. With the introduction of finer needles (24–28 gauge) and atraumatic pencil-point designs (Whitacre, Sprotte), the incidence has significantly decreased to 1–5%. However, despite technological advancements, PDPH continues to occur, particularly with cutting needles such as the Quincke type (7).

Previous studies in Pakistan and internationally have reported varying PDPH rates with 25-gauge Quincke needles, ranging from approximately 14% to 25%. Although smaller gauge needles reduce PDPH incidence, they may be associated with technical difficulty and higher failure rates. Therefore, balancing needle size and clinical effectiveness remains important (8). Spinal anesthesia also carries other complications such as hypotension, nausea, shivering, high spinal block, and rarely neurological injury. Nevertheless, it offers several advantages including reduced postoperative nausea and vomiting, decreased intraoperative blood loss, early mobilization, and high patient satisfaction (9). Given the continued use of 25-gauge Quincke spinal needles in many institutions, including local tertiary care centers, it is essential to determine the current incidence of PDPH and its associated risk factors in our population (10).

MATERIALS AND METHODS

This descriptive cross-sectional study was conducted over a four-month period from August to November 2024 in the Departments of Obstetrics and Gynecology, Urology, and Orthopedics at Saidu Group of Teaching Hospital, Saidu Sharif Swat, and Timergara Teaching Hospital, Lower Dir. A total of 319 patients undergoing lower-segment surgical procedures under spinal anesthesia were enrolled. Only patients receiving spinal anesthesia with a 25-gauge Quincke spinal needle were included in the study. Patients aged 15–60 years, of either gender, and classified as American Society of Anesthesiologists (ASA) physical status I or II were eligible for inclusion. Patients with ASA status greater than II, age below 15 or above 60 years, failed lumbar puncture, use of spinal needles other than 25-gauge Quincke, development of complications other than PDPH, or refusal to participate were excluded. Ethical approval was obtained from the respective institutional review boards prior to initiation of the study. Eligible patients were evaluated preoperatively, informed about the purpose of the study, and written informed consent was obtained. Demographic variables and procedural details, including number of attempts and time of spinal anesthesia, were recorded. Postoperatively, patients were followed daily for three days to assess the occurrence of post-dural puncture headache. The onset, characteristics, and severity of headache were documented using a structured questionnaire. Data was analyzed using Statistical Package for Social Sciences (SPSS) version 22. Descriptive statistics were calculated as frequencies and percentages, and results were presented in tables and graphs.

RESULT

A total of 319 ASA I–II patients were enrolled, and all successfully received spinal anesthesia using a 25-gauge Quincke spinal needle. The overall incidence of PDPH was 20.7% (66/319). Among affected patients, most were aged 15–30 years (38; 57.6%), followed by 31–45 years (21; 31.8%) and 46–60 years (7; 10.6%). PDPH occurred predominantly in females (60; 90.9%) compared to males (6;

9.1%). Regarding BMI, most cases were observed in patients with normal weight (41; 62.1%), followed by overweight (22; 33.3%) and obese individuals (3; 4.5%), while no underweight patient developed PDPH. The majority of PDPH cases were reported in gynecology/obstetrics (44; 66.7%), followed by urology (12; 18.2%) and orthopedics (10; 15.2%). PDPH was more frequent after multiple puncture attempts (45; 68.2%) compared to a single attempt (21; 31.8%) and occurred predominantly when the procedure was performed in the sitting position (64; 97.0%) rather than the lateral position (2; 3.0%). (Table 3.1)

Table 3.1: Baseline Characteristics of Participants (n = 319)

Variable	Frequency	Percentage (%)
Age Group		
15–30 years	158	49.5
31–45 years	103	32.3
46–60 years	58	18.2
BMI		
Underweight	2	0.6
Normal weight	164	51.4
Overweight	131	41.1
Obese	22	6.9
Gender		
Male	112	35.1
Female	207	64.9
Department		
Gynecology/Obstetrics	132	41.4
Orthopedics	103	32.3
Urology	84	26.3

The Figure 3.1 and Table 3.1 Statistical analysis shows BMI of participants. We divide the BMI in four categories “1 underweight (<18.5 kg/m³) with 2 patients (0.63%) 2 Normal Weight (18.5-24.9 kg/m³) with 164 patients (51.41%) 3 Overweight (25-29.9 kg/m³) with 131 patients (41.07%) 4 Obese (>30 kg/m³) with 22 patients (6.90%)”.

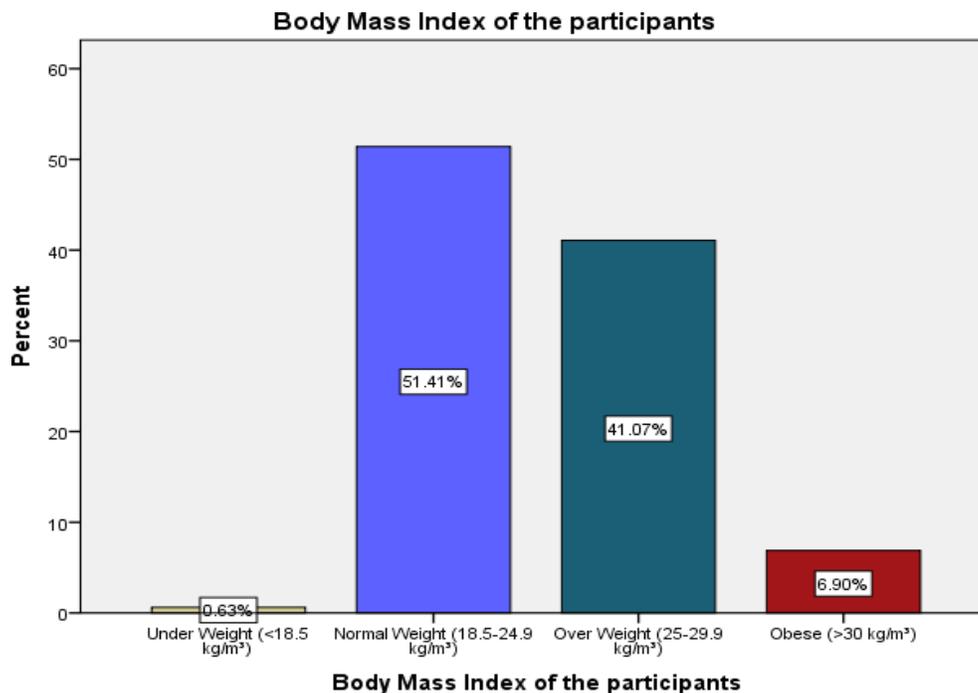


Figure 1 BMI of the Participant

Statistical analysis shows that 40 patients (12.54%) of 319 patients have a headache before spinal anesthesia while 279 patients (87.46%) had no such problem. (Table 3.2)

Table 3.2: History of Headache Before Spinal Anesthesia

Response	Frequency	Percentage (%)
Yes	40	12.5
No	279	87.5
Total	319	100.0

Following spinal anesthesia, 66 patients (20.7%) reported headaches, most of which were associated with symptoms such as nausea, vomiting, photophobia, dizziness, blurred vision, and tinnitus. The headache typically worsened within 15 minutes of sitting or standing and improved within 15 minutes of lying down in 67 patients (21.0%). Additionally, 66 patients (20.7%) experienced an occipital headache radiating anteriorly, consistent with classical post-dural puncture headache features.(Table 3.3)

Table 3.3: Post-Spinal Anesthesia Headache and Associated Symptoms

Variable	Yes	No	Total
Headache after procedure	66 (20.7%)	253 (79.3%)	319 (100%)
Associated symptoms (nausea, vomiting, photophobia, dizziness, blurred vision, tinnitus)	66 (20.7%)	253 (79.3%)	319 (100%)
Headache worsens within 15 min of sitting/standing and improves within 15 min of lying	67 (21.0%)	252 (79.0%)	319 (100%)
Occipital headache radiating anteriorly	66 (20.7%)	253 (79.3%)	319 (100%)

Most patients (266; 83.4%) received spinal anesthesia on a single attempt, while 53 patients (16.6%) required multiple attempts. The procedure was predominantly performed in the sitting position (315; 98.7%) compared to lateral decubitus (4; 1.3%). Among those who developed headaches, the majority reported mild intensity (255; 79.9%), while moderate and severe headaches occurred in 37 (11.6%) and 27 (8.5%) patients, respectively. (Table 3.4)

Table 3.4: Spinal Anesthesia Attempts, Position, and Headache Severity (n = 319)

Variable	Category	Frequency	Percentage (%)
Number of attempts	Single	266	83.4
	Multiple	53	16.6
Position during procedure	Sitting	315	98.7
	Lateral	4	1.3
Headache severity	Mild	255	79.9
	Moderate	37	11.6
	Severe	27	8.5

The bar chart depicts the incidence of post-dural puncture headache (PDPH) following spinal anesthesia in 319 patients. PDPH was most common in younger patients aged 15–30 years (58%) and declined with age, reaching only 11% in the 46–60-year group. Among BMI categories, normal-weight patients (18.5–24.9 kg/m²) experienced the highest incidence (62%), followed by overweight (33.3%) and obese patients (4.5%). Female patients were disproportionately affected (91%) compared to males (9.1%). Procedurally, PDPH occurred more frequently during gynecologic and obstetric surgeries (67%) than in urology (18%) or orthopedic procedures (15%). The likelihood of headache increased with multiple spinal attempts (68%) versus a single attempt (32%) and was markedly higher when the procedure was performed in the sitting position (97%) compared to lateral decubitus (3%). (Figure 3.2)

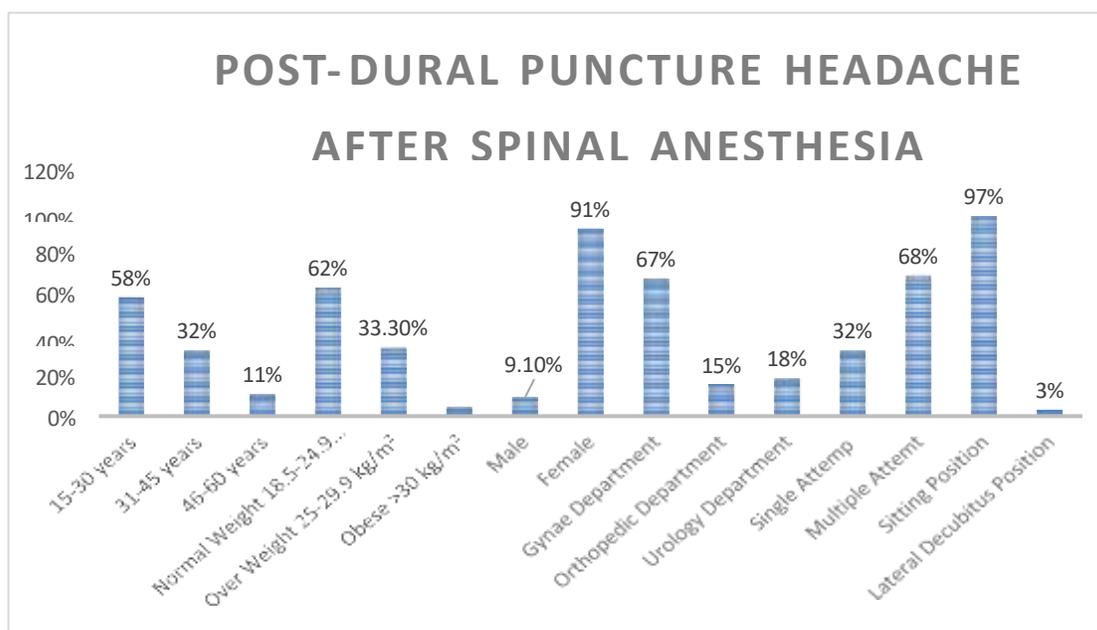


Figure 2 Post-Dural Puncture Headache After Spinal Anesthesia

DISCUSSION

Post-dural puncture headache (PDPH) remains a significant complication of spinal anesthesia, primarily resulting from cerebrospinal fluid (CSF) leakage after dural puncture, leading to intracranial hypotension, traction on pain-sensitive structures, and reflex vasodilation (11).

Our study found a higher incidence of PDPH in younger patients, particularly those aged 15–30 years, which aligns with previous research indicating that PDPH is most common in young adults and decreases with age, likely due to age-related changes in dura mater elasticity and CSF dynamics (9). Females were disproportionately affected in our study, consistent with multiple studies reporting higher risk in women. Hormonal and physiological factors, including increased estrogen and vascular reactivity, may contribute to this susceptibility, particularly in obstetric populations (12). These findings highlight the need for targeted preventive strategies; therefore, we recommend providing adequate preoperative counseling to young and female patients regarding their elevated PDPH risk to ensure informed consent and manage expectations.

Procedural factors also played a significant role. Multiple lumbar puncture attempts were associated with higher PDPH incidence, supporting literature that repeated punctures exacerbate CSF leakage and delay dural healing (14). This underscores the critical importance of clinical expertise and technique. To mitigate this risk, it is essential to minimize the number of lumbar puncture attempts to reduce CSF leakage and PDPH risk. Patient positioning also influenced PDPH occurrence; patients in the sitting position had higher rates, likely due to increased dural tension and CSF loss, which is consistent with some observational studies (13). Based on this, we recommend that clinicians consider using the lateral decubitus position where it is feasible to decrease dural tension and headache occurrence. Needle characteristics, such as gauge and tip type, remain critical modifiable risk factors, with smaller, atraumatic needles reducing PDPH incidence compared to larger, cutting needles (14). Consequently, we advocate for the practice to prefer smaller gauge, atraumatic needles for spinal anesthesia to lower PDPH incidence (15, 16).

Overall, PDPH is multifactorial, involving patient-related and technical variables. These findings reinforce best practices in spinal anesthesia, emphasizing careful needle selection, minimizing repeated attempts, and optimizing patient positioning to reduce PDPH risk (17, 18). Furthermore, integrating these preventive measures with vigilant postoperative care is crucial; therefore, we recommend that clinical teams monitor patients closely postoperatively, especially in high-risk groups, for early recognition and management of PDPH (19, 20).

CONCLUSION

The overall incidence of pdph following spinal anesthesia with a 25-gauge quincke needle was 20.7%, indicating a considerable complication rate. Younger patients, particularly those aged 15–30 years, were more frequently affected. Female patients experienced a disproportionately higher incidence, especially in gynecologic and obstetric procedures. Multiple lumbar puncture attempts and sitting position during the procedure were strongly associated with increased pdph. Normal-weight patients showed the highest incidence, emphasizing the multifactorial nature of pdph involving patient characteristics and procedural factors.

RECOMMENDATIONS

Minimize the number of lumbar puncture attempts to reduce csf leakage and pdph risk. Consider using lateral decubitus position where it is feasible to decrease dural tension and headache occurrence. Prefer smaller gauge, atraumatic needles for spinal anesthesia to lower pdph incidence. Provide adequate preoperative counseling to young and female patients regarding pdph risk. Monitor patients closely postoperatively, especially in high-risk groups, for early recognition and management of pdph.

AUTHOR CONTRIBUTIONS

Author	Contribution
Umar Farooq*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Umar Nawaz Khan	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Taj Nabi	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Peer Sabir Shah	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Amjad Ali	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Hidayat Ullah	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Bilal Ahmad	Contributed to study concept and Data collection Has given Final Approval of the version to be published

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