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Comparative Study Of Post Dural Puncture Headache By Using 25g Vs. 27g Quincke Spinal Needles In Cesarean Section Surgery

[1]Rimsha Abid, [2]Muhammad Yousaf, [3]Areeba Rashid, [4]Sidra Mehboob, [5]Shahroz Saeed, [6]Muhammad Arbaz, [7]Malaika Ajmad, [8]Omama Shahid

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Rimsha Abid
Lecturer, Department of Emerging Allied Health Technology, Faculty of Allied Health Sciences, Superior University, Lahore
Muhammad Yousaf
Student of BS of Anesthesia, Department of Emerging Allied Health Technology, FAHS, Superior University Lahore.
Areeba Rashid
Student of BS of Anesthesia, Department of Emerging Allied Health Technology, FAHS, Superior University Lahore.
Sidra Mehboob
Student of BS of Anesthesia, Department of Emerging Allied Health Technology, FAHS, Superior University Lahore.
Shahroz Saeed
Student of BS of Anesthesia, Department of Emerging Allied Health Technology, FAHS, Superior University Lahore.
Muhammad Arbaz
Student of BS of Anesthesia, Department of Emerging Allied Health Technology, FAHS, Superior University Lahore.
Malaika Ajmad
Student of BS of Anesthesia, Department of Emerging Allied Health Technology, FAHS, Superior University Lahore.
Omama Shahid
Lecturer, Department of Emerging Allied Health Technology, Faculty of Allied Health Sciences, Superior University, Lahore

ABSTRACT

Post-Dural puncture headache (PDPH) is a prevalent complication following spinal anesthesia, particularly in cesarean sections, and the size of the needle used may significantly influence its incidence. This study aimed to compare the incidence of PDPH and the severity of associated pain between two commonly used spinal needles: the 25-gauge (25G) and the 27-gauge (27G) Quincke needles. The primary objective was to evaluate the differences in PDPH occurrence and pain severity, as measured by the Total Numeric Rating Scale (TNRS), between patients administered spinal anesthesia with either 25G or 27G needles. Data were meticulously collected from three hospitals in Lahore, focusing on patients who underwent cesarean sections under spinal anesthesia. The occurrence of PDPH was documented, and pain scores were assessed using the TNRS. Statistical analyses were performed using t-tests to compare means, Chi-Square tests to evaluate categorical data, and Pearson correlation coefficients to assess relationships between variables. The findings revealed a higher incidence of PDPH in patients who received the 27G needles (43.2%) compared to those who received the 25G needles (28.2%). Furthermore, patients experiencing PDPH reported significantly higher TNRS scores, with a mean score of 11.25. Statistical analysis confirmed significant differences between the two groups, with a t-value of -32.53 ($p = 0.00$) and a Chi-Square value of 180.00 ($p = 0.00$). Additionally, strong negative correlations were identified between needle size and both the incidence of PDPH ($r = -1.00$) and TNRS scores ($r = -0.925$), indicating that as the gauge of the needle increased, the incidence of PDPH and pain severity decreased. The results of this study suggest that the use of 25G Quincke needles is associated with a reduced risk of PDPH and lower pain severity compared to 27G needles. These findings underscore the importance of proper needle selection in spinal anesthesia, as it can significantly enhance patient outcomes and minimize complications. Further research is warranted to explore the underlying mechanisms and to establish standardized practices for needle selection in clinical settings.

INTRODUCTION

Spinal anesthesia has emerged as a preferred anesthetic technique for cesarean sections due to its rapid onset, ability to eliminate the need for airway management, and reduced procedural risks. This method not only minimizes the risk of aspiration but also avoids the complications associated with general anesthesia, such as respiratory depression and prolonged recovery times. However, a significant complication associated with spinal anesthesia is post-Dural puncture headache (PDPH), which has been reported to occur in 0.1% to 36% of cases (1). PDPH is characterized by a debilitating headache that typically manifests 2-3 days after the Dural puncture, often accompanied by symptoms such as nausea, vomiting, and photophobia. The incidence of PDPH can be influenced by various factors, including needle size, type, and the number of puncture attempts (2).

The choice of spinal needle gauge is critical in determining the risk of PDPH. Larger diameter needles, such as the 25-gauge (25G) Quincke needle, have been associated with a higher incidence of PDPH compared to smaller needles like the 27-gauge (27G) Quincke needle. Studies have shown that the design of the needle tip also plays a role, with cutting needles being more likely to cause PDPH than non-cutting pencil-point needles. Despite advancements in needle technology, the occurrence of PDPH remains a concern, particularly in obstetric patients who are more susceptible due to demographic factors such as age and gender (3).

This study aims to investigate the incidence of PDPH in patients undergoing cesarean sections using either 25G or 27G Quincke spinal needles. By comparing the two needle sizes, the research seeks to provide insights into how needle selection can impact patient outcomes, particularly in terms of reducing the incidence and severity of PDPH. Understanding these dynamics is essential for anesthesiologists to optimize their practices and improve patient care during cesarean deliveries (4).

A study conducted at a 250-bedded general hospital in Kurigram, Bangladesh, assessed the incidence of PDPH among 80 full-term primiparous women who received spinal anesthesia with either a 25G or 27G Quincke needle (5). The results indicated that the incidence of PDPH was significantly higher in the 25G group (25%) compared to the 27G group (10%), highlighting the importance of needle gauge in predicting PDPH outcomes. The study also noted that the time taken to administer spinal anesthesia was longer with the 27G needle, suggesting a trade-off between the risk of PDPH and the efficiency of the procedure (6).

Another study conducted in Peshawar evaluated the impact of needle size on PDPH incidence among 200 patients receiving spinal anesthesia for cesarean sections. The findings revealed that the use of 25G needles resulted in a 35% incidence of PDPH, while the 27G needles produced a significantly lower rate of 15%. This research emphasized the need for healthcare professionals to prioritize smaller-gauge needles and minimize the number of punctures attempts to reduce the risk of PDPH in cesarean section patients (7).

Future research should focus on exploring the long-term effects of PDPH on patient recovery and satisfaction, as well as the potential benefits of using alternative needle designs that may further reduce the incidence of this complication. Additionally, studies could investigate the role of patient education and preoperative counseling in managing expectations regarding the risks associated with spinal anesthesia. Understanding the psychological impact of PDPH on patients may also provide valuable insights into improving overall care and support during the postoperative period (8,9).

In conclusion, the choice of spinal needle gauge is a critical factor in the incidence of post-Dural puncture headache following cesarean sections. This study underscores the importance of using smaller gauge needles, such as the 27G Quincke needle, to minimize the risk of PDPH while

maintaining effective anesthesia. As spinal anesthesia continues to be the preferred method for cesarean deliveries, further research and clinical practice improvements are essential to enhance patient outcomes and reduce the incidence of complications associated with this technique (10).

MATERIAL AND METHODS

Study Design: This is a cross-sectional study.

Clinical Settings: The research is taken place at Family hospital Lahore, Anesthesia Department, Gulab Devi Hospital Lahore Anesthesia Department, Vernal Hospital Lahore Anesthesia Department.

Duration of Study: The duration of the study was span 6 to 8 months.

Measuring Parameters: Pain assessment utilize the Numeric Rating Scale (NRS) (10).

SELECTION CRITERIA

INCLUSION CRITERIA

- Patients of any age and females admitted to the hospital for cesarean sections.
- Patients who received spinal anesthesia using a 25G Quincke spinal needle.
- Patients who received spinal anesthesia using a 27G Quincke spinal needle (11).
- Patients who have consented to the use of their data for this research.

EXCLUSION CRITERIA

- Patients with a history of neurological disorders was excluded.
- Patients with contraindications to spinal anesthesia was excluded (12).
- Patients who do not consent to receive spinal anesthesia.

Sample Size: A total sample size of 180 aimed for, with a 95% confidence interval and a 0.5% margin of error. $n = Z^2a/2\ P(1\text{-}P)\ /E^2$ (13)

Sampling Technique: A convenient sampling technique is employed to categorize patients into two groups.

DATA COLLECTION PROCEDURE

This study employed a comparative research design to evaluate the incidence of Post-Dural Puncture Headache (PDPH) and pain severity in cesarean section patients receiving spinal anesthesia with either a 25G or 27G Quincke spinal needle. Eligible participants, who provided consent, were assigned to groups based on clinical staff judgment. Spinal anesthesia was administered under sterile conditions at the L3-L4 or L4-L5 interspace, ensuring uniformity in drug dosage. Postoperative monitoring included assessing PDPH symptoms and pain severity using the Total Numeric Rating Scale (TNRS) over three days, with data collected through patient interviews and medical record reviews (14).

DATA ANALYSIS PROCEDURE

Data analysis for the study utilized SPSS version 28.0 or higher, a widely used statistical software. Descriptive statistics summarized key data aspects, including frequency distributions for categorical variables. The analysis employed Chi-Square tests to examine relationships between categorical variables and t-tests to compare means of continuous data. A significance level of $\alpha = 0.05$ was set, with p-values below this threshold indicating statistically significant results and leading to the rejection of the null hypothesis (15).

RESULTS

TABLE 1: AGE DISTRIBUTION

There are differences in the age distribution of patients in Groups 1 (25G) and 2 (27G). Group 2 had a greater percentage of younger patients (18–25 years old) (23.5%) than Group 1 (11.1%). In the same way, range 2 was more represented in the 26–35 age range (36.7%) than Group 1 was (23.3%). The distribution was more evenly distributed in the 36–45 age range, though, with Group 1 accounting for 36.4% and Group 2 for 27.8%. Notably, Group 1 had a higher

prevalence of people aged 46 and over (34.2%) than Group 2 did (16.7%). The incidence and intensity of post-Dural puncture headache (PDPH) as well as other clinical outcomes may be influenced by these variations in the age distribution.

Age Group (Years)	Group 1 (25G) (n=90)	Group 2 (27G) (n=90)
18-25	20 (11.1%)	10 (23.5%)
26-35	30 (23.3%)	20 (36.7%)
36-45	25 (36.4%)	30 (27.8%)
46 & above	15 (34.2%)	30 (16.7%)

TABLE 2: WEIGHT DISTRIBUTION

According to the weight distribution of the patients in Groups 1 (25G) and 2 (27G), most of the patients in both groups are between 71 and 80 kg in weight. In Group 1, 89% of patients weighed between 71 and 80 kg, whereas in Group 2, 78% of patients fell within the same range. In contrast, only 11.1% of patients in Group 1 and 21% of patients in Group 2 weighed between 60 and 70 kg. Because body weight might affect CSF fluid dynamics and overall reaction to spinal anesthetic, the slightly larger percentage of lighter individuals in Group 2 may have consequences for the occurrence and severity of post-Dural puncture headaches (PDPH).

Weight (kg)	Group 1 (25G) (n=90)	Group 2 (27G) (n=90)
60-70	10 (11.1%)	19 (21%)
71-80	80 (89%)	71 (78%)

TABLE 3: ASA PHYSICAL STATUS

There is a discrepancy in the distribution of patient health status between Group 1 (25G) and Group 2 (27G), according to the American Society of Anesthesiologists' physical state classification. A larger percentage of patients (60%) in Group 2 were categorized as ASA I (healthy individuals), compared to 34.3% of patients in Group 1. On the other hand, Group 1 had a higher percentage of ASA II patients (36.3%) than Group 2 did (40%) of patients with mild systemic illness. This implies that a greater percentage of patients in Group 1 had moderate systemic illnesses, which may have an impact on the incidence of post-Dural puncture headache (PDPH) and other perioperative and postoperative outcomes.

ASA Class	Group 1 (25G) (n=90)	Group 2 (27G) (n=90)
I	33 (34.3%)	54 (60%)
II	63 (36.3%)	36 (40%)

TABLE 4: OCCURRENCE OF HEADACHE

There were notable differences between the two groups in the incidence and intensity of post-Dural puncture headache (PDPH). While no patients in Group 2 (27G) had serious symptoms, a higher percentage of patients (62%) in Group 1 (25G) did. On the other hand, only 60% of patients in Group 2 experienced moderate headaches, whereas Group 1 did not experience any mild headache occurrences. Headaches of moderate intensity occurred more often in Group 1 which registered 41% cases while Group 2 reported 20%. The research findings indicate that needle placement with a 27G Quincke needle produces less Popup Headache Pressure Distress

PDPH than needle placement with a 25G needle. The smaller diameter of Dural puncture in 27G Quincke needle helps decrease cerebrospinal fluid leakage thereby minimizing related symptoms.

Severity	Group 1 (25G) (n=90)	Group 2 (27G) (n=90)
Mild	-	54 (60%)
Moderate	44 (41%)	18 (20%)
Severe	56 (62%)	-

TABLE 5: LOCATION OF HEADACHE

Blood vessel puncture headache locations varied between the two tested groups. The evaluation of post- Dural puncture headaches revealed that patients in Group 1 (25G) experienced mainly back-of-head pain affecting 65.7% of them while Group 2 (27G) patients had 61% incidence rates. Post-Dural puncture headaches required medical attention in twenty percent of Group 1 patients who experienced back of head pain yet Group 2 patients had neck pain affecting thirty-eight percent of them. The data indicated that PDPH occurred mainly in the back of the head in both groups yet Group 2 patients displayed higher neck pain rates because of potentially unique physical attributes and variations in spinal fluid drainage.

Location	Group 1 (25G) (n=90)	Group 2 (27G) (n=90)
Back of Head	69 (65.7%)	55 (61%)
Neck	21 (20%)	35 (38%)

TABLE 6: ADDITIONAL SYMPTOMS

The data from this research demonstrated vomiting occurred among 21% of 25G group patients and 18% of 27G group patients yet dizziness was recorded solely in the 27G users without any reports in the 25G patients. Nausea appeared rarely during the study and the 25G group faced it slightly more often than the subjects who received 27G (5% for the 25G group compared to 3% for the 27G group). Data from this study showed similar additional symptom incidence between Groups 1 and 2 because the combined symptoms of vomiting, dizziness, and nausea occurred in 63% and 61% of patients respectively. Research supports these results by showing that nausea incidents are normally slim and spinal needle size does not impact this outcome.

Symptom	Group 1 (25G) (n=90)	Group 2 (27G) (n=90)
Vomiting	23 (21%)	17 (18%)
Dizziness	-	18 (20%)
Nausea	5%	3%
All of Above	67 (63%)	55 (61%)

TABLE 7: SEVERITY OF PAIN

Spinal anesthesia symptom intensity levels demonstrated substantial differences between the examined patient groups. Out of all patients who received the 25G needle in Group 1 there was

a 71% incidence of severe symptoms while Group 2 (27G) demonstrated only 19% of patients reporting severe symptoms which highlights acute discomfort is more frequent when using the larger-gauge needle. The 27G group produced milder symptoms which surpassed the 25G group symptoms by 31% to 6% respectively while moderate symptoms developed in 23% and 17% of patients. The current research confirms previous work because it demonstrates that the 27G spinal needle causes less Dural trauma resulting in milder post-spinal anesthesia symptoms including post-Dural puncture headache.

Severity	**Group 1 (25G) (n=90)**	**Group 2 (27G) (n=90)**
Mild	5 (6%)	28 (31%)
Moderate	21 (23%)	15 (17%)
Severe	64 (71%)	17 (19%)

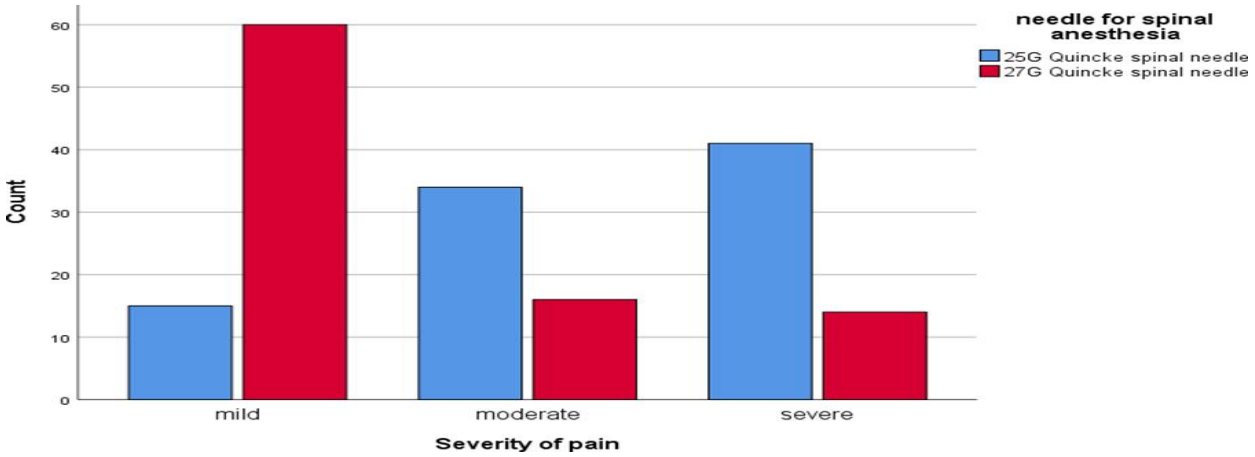
TABLE 8: DURATION OF HEADACHE

The two groups' post-Dural puncture headache (PDPH) durations differed. A considerable percentage of patients in Group 1 (25G) reported headaches for extended periods of time; 27.8% said their symptoms lasted 36 hours, 22.2% for 48 hours, and 16.7% for 72 hours. However, a greater proportion of patients in Group 2 (27G) had headaches that lasted less than six hours, with 22.2% reporting symptoms for just six hours and 33.3% reporting symptoms for twenty-four hours. Compared to 16.7% of patients in Group 1, only 5.6% of patients in Group 2 had headaches that lasted up to 72 hours.

Duration	**Group 1 (25G) (n=90)**	**Group 2 (27G) (n=90)**
6 Hours	10 (11.1%)	20 (22.2%)
24 Hours	20 (22.2%)	30 (33.3%)
36 Hours	25 (27.8%)	20 (22.2%)
48 Hours	20 (22.2%)	15 (16.7%)
72 Hours	15 (16.7%)	5 (5.6%)

FIGURE 1: THE BAR CHART REPRESENTS THE SEVERITY OF PAIN, BASED ON THE TYPE OF SPINAL ANESTHESIA NEEDLE USED (25G VS. 27G QUINCKE NEEDLE).

The provided bar chart displays data regarding PDPH intensity between patients who received 25G and 27G Quincke spinal needles after Dural puncture. Mild headache occurrences proved statistically higher across the patients who received 27G needles (60 cases) compared to patients who received 25G needles (15 cases). Data showed severe headaches occurred primarily in the 25G group at 42 cases while the same condition appeared in only 15 patients of the 27G group. The 25G group experienced moderate headaches at a higher rate than the 27G group since they reported 34 such cases compared to 15 of their counterparts. Cerebrospinal fluid leakage becomes lower using needle size 27G which leads to reduced PDPH severity.



DISCUSSION

This study aimed to evaluate the incidence of Post-Dural Puncture Headache (PDPH) in cesarean delivery patients receiving either 25G or 27G Quincke spinal needles. The findings provide significant insights into how the diameter of spinal needles influences the occurrence of PDPH, pain intensity, and overall patient outcomes (16).

The results indicated that patients who received 25G needles reported higher pain levels compared to those who received 27G needles, with 62% of the 25G group experiencing pain versus only 20% in the 27G group. This aligns with previous research that supports the use of 27G spinal needles over 25G needles, as smaller needle diameters are associated with lower pain levels and reduced incidence of PDPH due to smaller dural punctures and limited cerebrospinal fluid (CSF) loss (17). The 25G needles appear to cause more significant dural damage, leading to higher perceived pain and increased rates of PDPH. While the 27G Quincke needles significantly reduced pain severity, further research is warranted to explore the benefits of atraumatic (non-cutting) needles, such as Whitacre or Sprotte, which may offer additional advantages in minimizing PDPH and enhancing overall patient outcomes (18). Previous studies have indicated that the risk of PDPH is considerably lower with 27G Quincke needles compared to 25G, although the former may have a higher failure rate for successful lumbar puncture on the first attempt, suggesting that 27G Quincke needles should be preferred for spinal anesthesia in cesarean sections (19).

The study also highlighted a significant relationship between the occurrence of PDPH and pain severity, as measured by the Numeric Rating Scale (NRS). Patients who did not develop PDPH reported significantly lower pain levels than those who did (20). Clinically, these findings underscore the importance of effective PDPH management in reducing discomfort following spinal anesthesia and improving patient recovery. Previous literature has reported a high prevalence of PDPH among patients at the University of Gondar Teaching and Referral Hospital after spinal anesthesia, emphasizing the need for hospital management and anesthetists to minimize PDPH incidence by avoiding the use of larger needles and repeated attempts, particularly in female patients (21,22).

Demographic analysis revealed that the 27G group had a higher proportion of younger patients (ages 18-25) compared to the 25G group, with most patients in both groups aged 26-35. Additionally, a larger percentage of patients in the 71-80 kg weight range were in the 25G group (89%) compared to the 27G group (78%) (23). In terms of ASA Physical Status, a higher proportion of patients in the 27G group were classified as ASA I (60%), indicating healthier individuals, while the 25G group had more patients classified as ASA II (63%), suggesting a greater presence of mild health issues. These demographic and health status differences could

influence the outcomes related to PDPH incidence and severity between the two needle types. Previous studies have also indicated that the use of 25G Quincke spinal needles in young females for spinal anesthesia during cesarean sections is associated with a higher risk of PDPH. The use of thinner Quincke-type spinal needles has been shown to progressively reduce both the incidence and severity of PDPH, as pencil-point needles are believed to cause less damage to dural fibers by splitting them, resulting in a lower incidence of PDPH (24,25).

Furthermore, the study demonstrated that 27G Quincke spinal needles are associated with a lower incidence of severe headaches and shorter headache duration compared to 25G needles in cesarean patients (26). While moderate pain was more common with 25G needles, severe pain was significantly higher in the 25G group. Both groups reported headaches primarily at the back of the head, although patients in the 27G group experienced more frequent neck pain. The incidence of vomiting and dizziness was similar across both groups, along with other reported symptoms. Research indicates that PDPH occurs less frequently among patients who receive spinal anesthesia for cesarean sections with a 27G needle compared to those using 25G needles (27,28).

In conclusion, this study reinforces the notion that the choice of spinal needle gauge significantly impacts the incidence of PDPH and pain severity in cesarean delivery patients. The findings advocate for the use of 27G Quincke needles to minimize the risk of PDPH and enhance patient comfort. Future research should continue to explore the benefits of various needle designs and sizes to further improve patient outcomes in spinal anesthesia (29,30).

CONCLUSION

The researchers investigated PDPH development rates among cesarean section patients who received spinal anesthetic with 25G or 27G Quincke spinal needles. The research established that PDPH risk decreases when patients receive a 27G spinal needle instead of a 25G needle based on spinal needle measurements. Post-Dural Puncture Headache (PDPH) caused patients to rate their postoperative pain as highly severe on the Total Numeric Rating Scale (TNRS). All statistics tests and independent t-tests and Chi-Square assessments showed that substituting 27G needles over 25G needles brought about less Post- Dural Puncture Headache occurrence while diminishing associated pain intensity. Research confirms that the TNRS shows high reliability in measuring pain intensity because its Cronbach's α value reaches 0.87. Research evidence confirms that needle choice in spinal anesthesia helps minimize PDPH occurrence and improve treatment results. Future research must evaluate additional elements which affect PDPH development by exploring how patient demographics affect this complication as well as needle placement technique and patient hydration state so healthcare practices can be enhanced.

REFERENCES

1. Cook TM, Counsell D, Wildsmith JA, Royal College of Anaesthetists. Major complications of central neuraxial block: Report on the third national audit project of the Royal College of Anaesthetists. Br J Anaesth. 2009;102(2):179-90.
2. Mohammed EL, El-Shal SM. Efficacy of different size Quincke spinal needles in reduction of incidence of Post-Dural Puncture Headache (PDPH) in Caesarean Section (CS): Randomized controlled study. Egyptian Journal of Anaesthesia. 2017; 33:53-8.
3. Kwak KH. Postdural puncture headache. Korean J Anesthesiol. 2017;70(2):136-43.
4. Monserrate AE, Ryman DC, Ma S, Xiong C, Noble JM, Ringman JM, et al. Factors associated with the onset and persistence of post-lumbar puncture headache. JAMA Neurol. 2015;72(3):325-32.
5. Salik F, Kiliç ET, Akelma H, Güzel A. The effects of the Quincke spinal needle bevel insertion on postdural puncture headache and hemodynamics in obstetric patients. Anesth Essays Res. 2018;12(3):705-10.
6. Weji BG, Obsa MS, Melese KG, Azeze GA. Incidence and risk factors of postdural puncture headache: prospective cohort study design. Periop Med. 2020;9(1):1-6.
7. Lybecker H, Moller JT, May O, et al. Incidence and prediction of postdural puncture headache: A prospective study of 1021 spinal anesthesias. Anesth Analg. 1990; 70:389-94.
8. Ghosh S, Nayak SK, Roy S. Assessment of post-dural puncture headache in patients undergoing caesarean section: a comparison between 25 G Quincke vs. Whitacre needles. J Adv Med Med Res. 2017;8(3):1-7.
9. Xu H, Liu Y, Song Y, Kan S, Liu F, Zhang D, et al. Comparison of cutting and pencil-point spinal needle in spinal anesthesia regarding postdural puncture headache: A meta-analysis. Medicine. 2017; 96:14-23.
10. Ghanei MM, Mehraban MS. Comparison of the 25-, 26- and 27-Gauge Needles for Spinal Anesthesia. Pakistan Journal of Biological Sciences. 2015;18(6):290-4.
11. Wadood R, Tariq A. Post-dural puncture headache: comparison of 25 and 27G spinal needles in urological patients. KJMS. 2014;7(1):40-3.
12. Evans RW. Complications of lumbar puncture. Neurol Clin. 1998; 16:83-105.
13. Vandam LD, Dripps RD. Long term follow-up of patients who received 10,098 spinal anesthetics. Syndrome of decreased intracranial pressure (Headache, ocular and auditory difficulties). J Am Med Assoc. 1956; 161:586-91.
14. Vallejo MC, Mandell GL, Sabo DP, Ramanathan S. Postdural Puncture Headache: A Randomized Comparison of Five Spinal Needles in Obstetric Patients. Anesth Analg. 2000; 91:916-20.
15. Bezov D, Lipton RB, Ashina S. Post-dural puncture headache: part I diagnosis, epidemiology, etiology, and pathophysiology. Headache. 2010; 50:1144-52.
16. Halpen S, Preston R. Post-dural puncture headache and spinal needle design: meta-analysis. Anaesth. 1994; 81:1376-83.
17. Kaydu A, Akdemir M, Yanlı Y, Özdemir M, Gökçek E, Karaman H. The postdural puncture headache and back pain: The comparison of 26-gauge atraumatic and 26-gauge Quincke spinal needles in obstetric patients. Anesth Essays Res. 2017; 11:458-62.
18. Aregawi Kassa A, Beyen TK, Denu ZA. Post Dural Puncture Headache (PDPH) and associated factors after spinal anesthesia among patients in University of Gondar Referral and Teaching Hospital, Gondar, North West Ethiopia. J Anesth Clin Res. 2015; 6:7.
19. Kiliç E, Salik F, Akelma H, Güzel A. The effects of the Quincke spinal needle bevel insertion on postdural puncture headache and hemodynamics in obstetric patients. Anesth Essays Res.

2018; 12:705.
20. Alam MZ, Rahman MA, Musa MA, Kamal MM. Post Dural Puncture Headache Following Subarachnoid Block for Caesarean Section: A Comparison Between 25G And 27G Quincke Spinal Needle.
21. Khan S, Naseem C, Khan MA, Ullah S, Rehman A, Tayyeb M, Ahmad F, Najeeb M. Comparison of the Incidence of Postdural Puncture Headache Following Spinal Anesthesia in Cesarean Sections Using 25g and 27g Needles with Median and Paramedian Approaches. Indus Journal of Bioscience Research. 2025 Jan 27;3(1):639-46.
22. Azad MA, Ahamed TI, Rahman M, Atique OB, Rahman H, Iqbal AS, Islam MS. Post Dural Puncture Headache (PDPH) after spinal anaesthesia: A comparative study between 25G and 27G Quincke needle.
23. Hussain M. Post-dural puncture headache: a comparative study of 22- and 25-gauge Quincke needles for caesarean sections in the Obstetrics and Gynecology Hospital in Karbala.
24. Baral PP, Pathak L, Udaya RK, Lawoju A, Pokhrel S, Gupta PK. Post Dural Puncture Headache After Elective Caesarean Section Using 27 G Quincke and Whitacre Spinal Needles: A Comparative Study. Journal of Universal College of Medical Sciences. 2021 Jun 22;9(01):4-8.
25. Jasra HA, Ahmad H, Khalid S, Aftab S, Khalid H. Post Dural Puncture Headache: A Comparison of 25 G and 27 G Quincke Spinal Needles in Patients Undergoing Elective Caesarean Section under Spinal Anaesthesia. Methodology. 2021; 30:5.
26. Deligöz Ö, Tuncel Z. Post Dural Puncture Headache: The Different Quincke Spinal Needles in Caesarean Section Patients in Somalia. International Medical Journal. 2023 Feb 1;30(1).
27. Khalid M, Ashfaq M, Obaid A, Javed H, Iqbal A, Butt M. Biological and Clinical Sciences Research Journal.
28. Kambale M, Jadhav SJ. Incidence of post-dural lumbar puncture headache (PDLPH) in comparison between emergency and elective lower segment cesarean section (LSCS) with 26G Quincke–Babcock cutting-beveled spinal needle. Saudi Journal of Anaesthesia. 2024 Jul 1;18(3):338-45.
29. Tahir SA, Fakhr F, Mahmood RA, Rehman WU. Comparison of Post Dural Puncture Headache Among Patients Administrated Spinal Anesthesia with 25 Gauge and 27 Gauge Needles Undergoing Elective Cesarean Section. Pakistan Armed Forces Medical Journal. 2024 Oct 2;74.
30. Lakhe G, Shrestha P, Duwadi V. Postdural Puncture Headache after Spinal Anaesthesia in Parturients Undergoing Cesarean Section in the Department of Anesthesia in a Tertiary Care Center: A Descriptive Cross-sectional Study. JNMA: Journal of the Nepal Medical Association. 2023 May;61(261):417-22.