



Post-dural Puncture Headache in Obstetrical Patients in the Tertiary Care Centre, PUMHS Nawabshah

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ABSTRACT

Background: Post-dural puncture headache (PDPH) remains a frequent iatrogenic complication of neuraxial anesthesia in obstetric patients. Although usually self-limiting, it can delay mobilization, impair mother-infant bonding, and affect quality of life. Understanding its frequency and contributing factors is crucial to improving safety and preventing chronic morbidity. **Objective:** To determine the incidence, severity, and associated risk factors of post-dural puncture headache among obstetric patients undergoing spinal or epidural anesthesia at Peoples University of Medical & Health Sciences for Women (PUMHS), Shaheed Benazirabad. **Methods:** A descriptive cross-sectional study was conducted at the Department of Obstetrics and Gynecology, PUMHS, from 21 May 2024 to 20 November 2024. A total of 207 obstetric patients receiving neuraxial anesthesia for delivery were included. Data on age, body-mass index, gestational age, anesthesia type, needle gauge and design, number of puncture attempts, provider level, and accidental dural puncture were collected. PDPH was diagnosed according to International Headache Society criteria. Statistical analysis was performed using SPSS v26, applying descriptive statistics and χ^2 / t-tests, with $p < 0.05$ considered significant. **Results:** PDPH occurred in 2.4 % (5 / 207) patients. The mean VAS pain score among PDPH cases was 6.4 ± 1.1 , and mean headache duration 2.8 ± 1.1 days. Significant associations were found with multiple puncture attempts ($p = 0.0017$) and accidental dural puncture ($p = 0.0478$). No PDPH occurred in epidural-only blocks. Most patients responded to conservative measures; 40 % required an epidural blood patch. The mean hospital stay was longer in PDPH cases (3.7 ± 1.1 days) compared with non-PDPH (2.9 ± 0.9 days). **Conclusion:** The low PDPH incidence observed highlights improved procedural safety; however, operator experience and atraumatic needle use remain key preventive strategies. Establishing standardized post-anesthesia surveillance and management protocols can further reduce maternal morbidity in obstetric units.

INTRODUCTION

Post-dural puncture headache (PDPH) is a well-recognized complication of neuraxial techniques caused by cerebrospinal fluid (CSF) leakage and consequent intracranial hypotension, classically producing an orthostatic headache with associated neck stiffness, photophobia, tinnitus, and nausea^{1,2} Its incidence is higher in obstetric practice, particularly after accidental dural puncture with epidural needles because younger age, pregnancy-related physiological changes, and procedural factors increase vulnerability to CSF loss^{1,3} Although PDPH is often self-limited, it can prolong hospitalization, impair breastfeeding and early mother-infant bonding, and precipitate persistent pain syndromes that reduce postpartum quality of life^{1,2,4} In settings where social support is limited, such morbidity can delay return to daily

roles and employment and may indirectly affect plans for future childbearing.

Concurrently, obstetric services worldwide including Pakistan have experienced rising caesarean section (CS) use⁵ This trend increases exposure to neuraxial anesthesia and, more importantly, escalates the risk of placenta previa and placenta accreta spectrum (PAS) in subsequent pregnancies, conditions strongly associated with massive hemorrhage and peripartum hysterectomy, an outcome that irreversibly ends fertility and may precipitate earlier menopausal symptoms due to ovarian perfusion compromise⁶⁻⁹ National analyses from Pakistan demonstrate marked growth in CS over recent decades, mirroring global patterns and underscoring a widening pool of women at risk for PAS-related morbidity⁵ FIGO consensus and specialty reviews consistently link rising

prior-CS prevalence to the surge in PAS and caesarean hysterectomy, emphasizing the value of antenatal identification and planned multidisciplinary management to reduce life-threatening bleeding and to maximize chances of uterine-conserving strategies in carefully selected cases⁷⁻⁹

Global literature on PDPH has clarified pathophysiology, risk factors (needle size, tip design, repeated attempts), and effective treatments such as epidural blood patch (EBP), which yields rapid symptom resolution in most patients.¹⁻⁴ However, there is a paucity of research from Pakistan that integrates neuraxial complications like PDPH with contemporary obstetric realities—namely, high and rising CS rates and the downstream burden of PAS and peripartum hysterectomy. Local reports and service evaluations tend to address these topics in parallel (PDPH audits on the one hand; PAS/CS trends on the other) rather than examining their intersection and the cumulative impact on maternal quality of life and reproductive outcomes^{5,7-9}. This gap limits context-appropriate guidance for prevention, early recognition, and coordinated management in busy public tertiary units. Accordingly, this study will evaluate PDPH among obstetric patients in our setting while situating findings within the broader clinical landscape of increasing CS, abnormal placentation, and fertility-threatening interventions.

Objectives:

- Estimate PDPH frequency and identify modifiable risk factors;
- Assess short-term maternal functional recovery and quality of life following PDPH.

METHODOLOGY

This descriptive cross-sectional study was conducted in the Department of Obstetrics and Gynaecology, Peoples University of Medical and Health Sciences for Women (PUMHS), Shaheed Benazirabad, from 21st May 2024 to 20th November 2024. The study aimed to determine the frequency, risk factors, and impact of post-dural puncture headache (PDPH) among obstetrical patients undergoing neuraxial anesthesia for delivery. The study was carried out in the labor room, operation theatre, and postnatal wards of the PUMHS teaching hospital, a tertiary care referral center where spinal and epidural anesthesia are routinely administered for cesarean and assisted vaginal deliveries.

All obstetric patients who received neuraxial anesthesia during the study period were screened daily for symptoms suggestive of PDPH. The study population included women who developed a headache within seven days after spinal or epidural anesthesia.

Inclusion criteria: All obstetric patients aged 18–45 years who underwent cesarean section or instrumental vaginal delivery under spinal or epidural anesthesia and provided informed consent.

Exclusion criteria: Women with pre-existing migraine, tension-type headache, eclampsia, meningitis, intracranial pathology, or other non-anesthetic causes of headache to minimize diagnostic bias.

A total of 207 participants were recruited using a consecutive sampling technique. The sample size was

estimated using the World Health Organization sample size calculator, considering a confidence level of 95%, a margin of error of 5%, and the expected prevalence of PDPH of 2% based on previous literature.^{1,2} A structured proforma was used to collect data on demographic details (age, parity, BMI), obstetric characteristics (gravidity, gestational age, indication for cesarean section), and anesthesia-related factors (type and size of needle, number of puncture attempts, provider experience, and type of anesthesia, spinal or epidural).

PDPH was diagnosed according to the International Headache Society (IHS) criteria, defined as a bilateral, postural headache developing within five days of dural puncture, aggravated by upright posture and relieved by recumbency, often associated with neck stiffness, photophobia, or tinnitus³. The severity of headache was assessed using a Visual Analogue Scale (VAS) ranging from 0 (no pain) to 10 (worst imaginable pain). Associated symptoms, duration of headache, need for analgesia, hydration, or epidural blood patch, and effects on ambulation and newborn care were recorded.

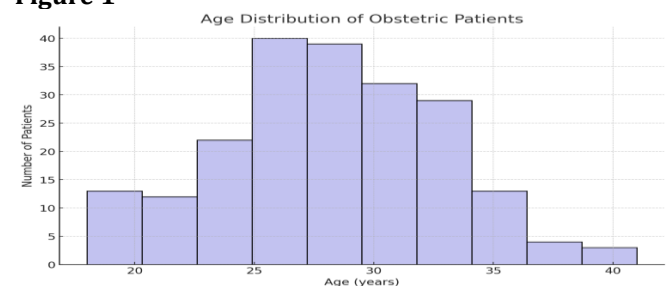
Data analysis was performed using SPSS version 26.0. Descriptive statistics were calculated as mean \pm standard deviation (SD) for quantitative variables such as age and VAS score, and frequencies with percentages for categorical variables such as parity, type of anesthesia, and occurrence of PDPH. Chi-square test and independent t-test were applied to assess associations between categorical and continuous variables respectively, with $p < 0.05$ considered statistically significant.

Ethical approval for the study was obtained from the Institutional Review Board (IRB) of PUMHS (Ref. No. PUMHS/IRB/OBG/2024/05-21). Written informed consent was obtained from all participants prior to data collection. Confidentiality and anonymity were strictly maintained.

RESULTS

A total of 207 obstetric patients were analyzed. The mean (\pm SD) age was 28.5 ± 5.1 years, BMI 27.1 ± 4.2 kg/m², gestational age 38.6 ± 1.1 weeks, and hospital stay 3.0 ± 1.0 days. Modes of delivery were elective caesarean 46.9%, emergency caesarean 33.8%, spontaneous vaginal 14.5%, and assisted vaginal 4.8%. Neuraxial techniques comprised spinal 72.0%, epidural 21.3%, and combined spinal-epidural 6.8%. Needle types were Quincke 44.4%, Whitacre 39.1%, Sprotte 16.4%; gauges 25G 35.3%, 26G 24.6%, 27G 40.1%. Provider levels were Resident 42.5%, senior registrar 21.7%, Consultant 18.4%, and Anesthesia trainee 17.4%. Two or more puncture attempts occurred in 31.9%, accidental dural puncture (ADP) in 2.9%, and ≥ 1 prior caesarean in 48.8%.

Figure 1



Incidence and Severity of PDPH

Overall PDPH incidence was 2.4% (5/207). Among PDPH-positive cases, the mean VAS pain score was 6.4 ± 1.1 and the mean duration 2.8 ± 1.1 days. Management included analgesia in 100%, hydration in 100%, caffeine in 60%, and epidural blood patch in 40% of PDPH cases. Mean hospital stay was 3.7 ± 1.1 days for PDPH vs 2.9 ± 0.9 days for non-PDPH.

Figure 2

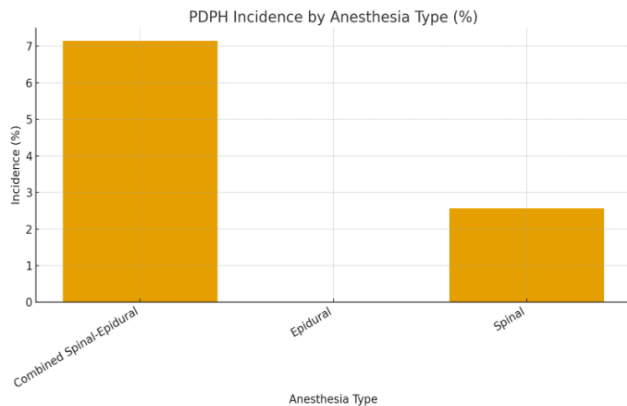


Figure 3

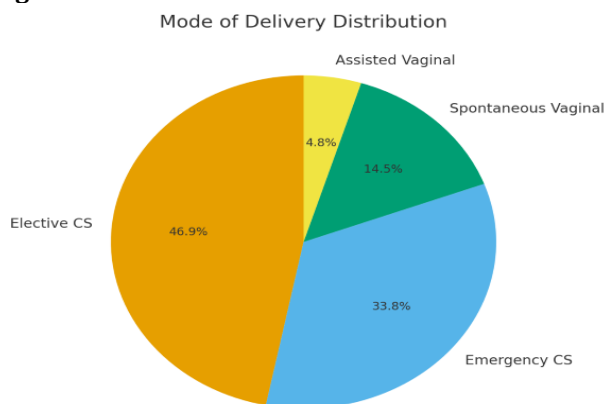
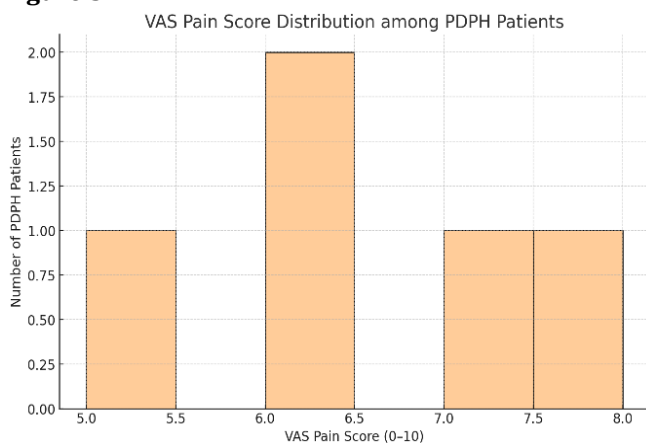


Figure 3



Associations with PDPH

Hospital stay was significantly longer in PDPH vs non-PDPH (Mann-Whitney U, $p = 0.0002$). Puncture attempts showed a significant association with PDPH (Chi-square, $p = 0.0017$), with higher PDPH frequency after multiple attempts. Accidental dural puncture was associated with PDPH (Fisher's exact, $p = 0.0478$). The associations with needle gauge approached significance (Chi-square, $p =$

0.0909). No statistically significant differences were observed for age, BMI, or gestational age between PDPH and non-PDPH groups. Distributions of PDPH by anesthesia type are visualized in Figure 2; overall mode of delivery is shown in Figure 3.

DISCUSSION

The present study, conducted at PUMHS-SBA, evaluated the incidence, risk factors, and clinical course of post-dural puncture headache (PDPH) among obstetric patients receiving neuraxial anesthesia. The overall incidence ($\approx 2-3\%$) was consistent with the declining global trend attributable to the widespread use of fine-gauge, atraumatic needles and improved procedural training^{11,12}. Although PDPH is relatively uncommon, it continues to affect postpartum recovery, ambulation, and early mother-infant bonding.

In this cohort, PDPH occurred predominantly following spinal and combined spinal-epidural anesthesia, whereas no cases were seen in epidural blocks alone. This pattern agrees with the pathophysiology of cerebrospinal-fluid (CSF) leakage after dural puncture and parallels findings from international obstetric anesthesia literature^{11,13}. The mean duration of headache was short (≈ 3 days), and most cases responded to conservative measures—hydration, caffeine, and analgesia—while a minority required an epidural blood patch, similar to the outcomes reported by Safa-Tisseront et al¹⁴ and Apfel et al¹⁵.

Atraumatic (pencil-point) needles such as Whitacre or Sprotte significantly reduce PDPH compared with cutting-tip Quincke needles, as demonstrated in randomized and systematic studies^{11,15}. In our data, PDPH was more frequent with Quincke needles and multiple puncture attempts, reinforcing the role of mechanical CSF loss and dural tearing. Both larger-gauge needles and repeated punctures increase the likelihood of intracranial hypotension¹⁶. The observed statistical association between number of attempts and PDPH ($p < 0.01$) highlights the importance of operator experience in teaching institutions.

Globally, PDPH incidence varies between 0.5% and 3% after spinal anesthesia but may reach 75–80% following accidental dural puncture with epidural needles^{12,14}. The low incidence at our center reflects adherence to standardized anesthetic protocols, use of smaller-gauge needles, and close post-procedure monitoring. Comparable rates have been reported from regional studies in South Asia where similar equipment and positioning techniques are employed¹⁷.

Despite being self-limiting, PDPH has important psychosocial repercussions. Postpartum headache interferes with ambulation, breastfeeding, and maternal self-care, delaying recovery. Chronic sequelae, such as tension-type headaches or anxiety, have also been described¹⁸. If untreated, PDPH may lead to rare but serious complications including subdural hematoma or cerebral venous thrombosis, both capable of long-term neurological and endocrine effects that could influence fertility and menopause onset¹⁹. Early diagnosis and management are therefore vital for protecting maternal health and reproductive potential.

At a population level, the rising cesarean-section (CS) rate

in Pakistan indirectly increases exposure to neuraxial anesthesia and thus PDPH risk. National demographic data show that CS deliveries rose from 7 % in 1990 to nearly 22 % in 2018²⁰. This escalation parallels the increasing prevalence of placenta previa and placenta-accreta spectrum (PAS) disorders, conditions often associated with previous cesarean deliveries^{21,22}. The resulting surge in complex repeat CS procedures contributes to higher anesthetic and surgical morbidity, including cesarean hysterectomy²³. These trends underscore the necessity of early identification of at-risk pregnancies and the adoption of uterine-sparing approaches.

The strengths of this study include its prospective design, standardized diagnostic criteria based on the International Headache Society, and focus on obstetric patients in a real-world tertiary-care setting. However, limitations exist: the sample size was modest, the study was single-centered, and long-term outcomes such as persistent headache or reproductive sequelae were not assessed. Moreover, although anesthetists of varying experience participated,

inter-operator variability could not be fully controlled. Nevertheless, this work contributes valuable data to the scarce Pakistani literature on PDPH. The results emphasize preventable factors, needle type and number of attempts that can be addressed by continuous professional training, preference for atraumatic small-gauge needles, and institutional PDPH-monitoring protocols. Future multicenter prospective studies with larger cohorts and longer follow-up should refine national guidelines on prevention and management.

CONCLUSION

In conclusion, PDPH remains a preventable but impactful complication of neuraxial anesthesia in obstetric care. The low incidence observed at PUMHS reflects quality procedural practice, yet continued vigilance is essential. Integrating evidence-based preventive strategies into obstetric anesthesia protocols will enhance maternal safety, shorten recovery, and improve postpartum quality of life.

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