ISSN (Print): 2663-9491 ISSN (Online): 2789-6897

Original Article

Incidence and Risk Factors for Post Dural Puncture Headache (PDPH) in Patients Undergoing Subdural Anesthesia

DOI: dx.doi.org

Mohammad Tazul Islam[1*], Nahidul Kadir[2], Amina Rahman[3]

Received: 19 November 2024
Accepted: 28 November 2024
Published: 15 December 2024

Published by:
Gopalganj Medical College,
Gopalganj, Bangladesh

*Corresponding Author

ABSTRACT

Introduction: *A typical side effect after spinal anesthesia or lumbar puncture is post-dural puncture headache (PDPH), which is characterized by excruciating headaches from CSF leakage. Patient demographics and procedural factors, including age, gender, body mass index (BMI), needle size, and number of puncture attempts, hydration status of the patient during post-operative period all influence the incidence of post-dural puncture headache (PDPH). The purpose of this study is to look into the incidence of PDPH and how it relates to these important factors.* ***Methods & Materials:*** *The study was conducted at Sheikh Hasina Medical College, Jamalpur, Bangladesh a tertiary care hospital from March, 2024 to May, 2024. Patients had both elective and urgent surgical operations under subdural anesthesia. The study included 200 patients in total, ranging in age from 18 to 65, who satisfied the inclusion requirements. Software for statistical analysis, SPSS version 26, was used. Statistical significance was attained when the p-value was less than 0.05.* ***Result:*** *A significant p-value of 0.02 was found in the research of 200 patients, indicating that females had a higher incidence of post-dural puncture headache (PDPH) (30%) than males (15%). The age categories of 41–50 (37.5%) and 51–65 (30%) had the highest rates of PDPH, with significant correlations (p = 0.01 and 0.02). Higher PDPH rates (66.7%, p < 0.001) were significantly correlated with more puncture attempts (>2). Incidence of PDPH was also shown to be higher in patients using wide bore needles*

(The Insight 2024; 7(1): 103-110)

1. *Assistant Professor, Department of Anesthesiology, Sheikh Hasina Medical College, Jamalpur, Bangladesh*
2. *Junior Consultant, Department of Anesthesiology, Jamalpur 250 Beded General Hospital, Jamalpur, Bangladesh*
3. *Assistant Professor, Department of Anesthesiology, Sheikh Hasina Medical College, Jamalpur, Bangladesh*

(23G; 40%, p = 0.001). Dehydration of the patient during post- operative period is significantly higher (60%, P=0.003) incidence to develop PDPH. ***Conclusion:*** *This study emphasizes age, gender, number of puncture attempts, needle size and hydration status of the patient during post-operative period variables linked to PDPH. A higher rate of perforation attempts, older age groups, females, wide bore needles and dehydration were all substantially associated with PDPH.*

Keywords: *Post-dural Puncture Headache, Cerebrospinal Fluid, Subdural Anesthesia*

INTRODUCTION

Post-dural puncture headache (PDPH) is a common and incapacitating result of purposely puncturing the dura-arachnoid, whether for therapeutic, diagnostic, or spinal anesthetic purposes, or inadvertently during an epidural procedure[1–5]. According to the diagnostic criteria of the International Headache Society (IHS), a headache may occur within the fifth day of puncture and subsequently go away on its own one week or up to 48 hours after the epidural blood patch is applied[6]. Stiff neck, tinnitus, photophobia, nausea, and hypoacusis are experienced. The incidence of post-dural puncture headache (PDPH) following spinal anesthesia may vary from less than 3 percent to up to 9 percent of patients, depending on the type and size of needle used[7-9]. After a lumbar puncture (LP), about 11% of patients develop post-dural puncture headache (PDPH) with the use of a standard, traumatic needle[10]. Prevalent patient risk factors for post-dural puncture headache include female sex, pregnancy, being between the ages of 18 and 50 years as opposed to older or younger, and having experienced a headache in the past. Post-dural puncture headache (PDPH) is two to three times more common in women than in men, according to numerous research[11]. Pregnancy increases the risk of post-dural puncture headache (PDPH) because of increased cerebral vasodilation in response to cerebrospinal fluid (CSF) hypotension, which is linked to increasing levels of circulating estrogen[12]. A prior history of headaches, including both post-dural puncture headaches (PDPH) and chronic headaches, may increase the risk of developing PDPH. even though it isn't always evident in research[11-18]. There is conflicting data about the relationship between BMI and the risk of having PDPH. Studies have shown that after diagnostic LP, people with low BMI (≤25 kg/m2) were more likely to develop PDPH[19]. Both the spinal needle choice and procedures can impact the risk of post-dural puncture headache. We advise utilizing pencil point (atraumatic) needles for spinal anesthesia or diagnostic Lumber Puncture (LP) in accordance with clinical practice recommendations[20,21]. Dehydration of the patient during 1st 48 hours of post operative period increase the rate of PDPH. In patients receiving subdural anesthesia, the purpose of the current study was to assess the incidence and risk factors for post-dural puncture headaches (PDPH).

METHODS & MATERIALS

The study was conducted at Sheikh Hasina Medical College, Jamalpur, Bangladesh a tertiary care hospital from March, 2024 to May, 2024. Patients had both elective and urgent surgical operations under subdural anesthesia. The study included 200 patients in total, ranging in age from 18 to 65, who satisfied the inclusion requirements. Adult patients scheduled for subdural anesthesia for surgery met the inclusion criteria; those with chronic headaches, pre-existing neurological disorders, or any contraindications to regional anesthesia were excluded. For every subject, written informed permission was acquired. Medical chart reviews and a standardized questionnaire were used to collect data. We use Bupivacaine with 8% dextrose (Bupivacaine Heavy) as anesthetic agent.

Expert anesthesiologists utilizing accepted methods carried out the subdural anesthetic procedure. Records were kept on the type and size of spinal needle used, the quantity of puncture attempts made, and the puncture level, hydration status of the patient during post-operative period. In order to determine the incidence of post-dural puncture headache (PDPH), postoperative follow-up was carried out. Based on the patient's reported headaches that got worse while standing and got better when lying down, PDPH was diagnosed within five days of surgery.

The study documented perioperative factors, such as the length of surgery, the total amount of local anesthetic agent used, and intraoperative problems, hydration status during post-operative period in addition to demographic characteristics, such as age, gender, BMI, and any comorbid disorders. Numerous punctures, needle size and type, dehydration and a history of headaches were assessed as risk factors for post-dural puncture headache (PDPH). After surgery, patients were monitored for seven days, and those who experienced post-dural puncture headache (PDPH) were treated conservatively with bed rest, fluids, and appropriate analgesics. Software for statistical analysis, SPSS version 26, was used. Statistical significance was attained when the p-value was less than 0.05.

RESULTS

This table outlines the basic demographics and characteristics of the study population. It shows that the sample is evenly divided by gender, has a variety of age groups, and a mix of BMI categories and comorbidities (**Table I**).

Table – I: Basic Characteristics of Study Population (*n*=200)

Characteristic	*n*(%)
Age (years)	
18-30	50 (25)
31-40	60 (30)
41-50	40 (20)
51-65	50 (25)
Gender	
Male	100 (50)
Female	100 (50)
BMI (kg/m^2)	
<25	80 (40)

25-29.9	90 (45)
≥30	30 (15)
Comorbidities	
Hypertension	40 (20)
Diabetes	30 (15)
None	130 (65)
Previous History of Headache	60 (30)

Table II shows the distribution of PDPH cases by age group. The highest incidence is observed in the 41-50 and 51-65 age ranges, both with significant *p*-values.

Table – II: Incidence of PDPH by Age Group (*n*=200)

Age Group (years)	Patients (*n*)	PDPH (*n*)	Percentage (%)	*p*-value
18-30	50	5	10	0.10
31-40	60	10	16.7	0.04
41-50	40	15	37.5	0.01
51-65	50	15	30	0.02

Table III illustrates the PDPH incidence by gender, showing that females had a higher rate of PDPH, with a statistically significant association.

Table – III: PDPH Incidence by Gender (*n*=200)

Gender	Patients (n)	PDPH (n)	Percentage (%)	*p*-value
Male	100	15	15	0.07
Female	100	30	30	0.02

Table IV demonstrates that an increasing number of puncture attempts is strongly associated with higher PDPH incidence, with a significant *p*-value.

Table IV: PDPH Incidence by Number of Puncture Attempts (*n*=200)

Number of Attempts	Patients (n)	PDPH (n)	Percentage (%)	*p*-value
1	120	10	8.3	0.12
2	50	15	30	0.02
>2	30	20	66.7	<0.001

Table V shows the association between the size of the spinal needle and the incidence of PDPH, with wide bore needles (23G) being associated with a significantly higher rate of PDPH.

Table – V: PDPH Incidence by Needle Size (n=200)

Needle Size (Gauge)	Patients (n)	PDPH (n)	Percentage (%)	*p*-value
23G	50	20	40	0.001
25G	80	15	18.8	0.02
27G	70	10	14.28	0.03

Table VI shows the association between rehydrated and dehydrated patient during post-operative period. More severity of dehydration significantly higher the development of PDPH.

Table – VI: PDPH Incidence by Hydration Status of the Patient During Post-Operative Period

Hydration Status	Patients	PDPH	Percentage	*p*-value
No sign of dehydration	120	12	10	0.20
Some sign of dehydration	50	15	30	0.04
Severe dehydration	30	18	60	0.003

DISCUSSION

The information showed a strong correlation between PDPH incidence and age. The age groups of 41–50 (37.5%) and 51–65 (30%) had the greatest rates, with statistically significant p-values (p=0.01 and 0.02, respectively). The younger age groups showed no significant p-value and a lower incidence (10%), especially those between the ages of 18 and 30. These results are in line with other research that suggests age-related changes in dural flexibility and cerebrospinal fluid (CSF) dynamics may make older persons more vulnerable to post-dural puncture headache (PDPH). According to a study, patients over 40 years of age had a greater incidence of PDPH, which was linked to enhanced dura mater sensitivity in the elderly[22].

With a p-value of 0.02 females had a substantially greater incidence of PDPH (30%) than males (15%). The literature has extensively reported this gender gap, with earlier research indicating that women are more likely to develop post dural puncture (PDPH). Hormonal variations, specifically the impact of estrogen on the neurological and circulatory systems, provide one tenable explanation. Gender is an important risk factor, as evidenced by a study by Vallejo et al. that found a similar pattern with PDPH incidence of 27% in females and 13% in males[23].

Although the association between BMI and PDPH incidence was not explicitly examined in this study, previous research has suggested that a lower BMI may be linked to a higher risk of developing PDPH. Although 15% of patients in this study had a BMI of ≥30 kg/m^2 and 45% of patients had a BMI of 25–29.9 kg/m^2, there was no discernible relationship found between PDPH rates and BMI. Since studies like

those by Bezov et al. have demonstrated that people with lower BMI have a higher incidence of PDPH because they have less epidural fat cushioning the spinal column, more research in this area may shed light on the matter [24].

There was a clear correlation found between the probability of PDPH and the quantity of puncture attempts. *p*-values ($p<0.001$ and $p = 0.12$, respectively) showed that patients who had more than two puncture attempts had a significantly greater incidence (66.7%) compared to those who had only one try (8.3%). This result is consistent with other research suggesting that repeated puncture attempts raise the risk of larger dural rips and increased CSF leakage. Similar findings were reported in a research by Ahmed et al., which showed that after two or more punctures PDPH increased significantly [25].

As the gauge numerically smaller (e.g. 23G) bore of the needle is relatively wider and vice-versa, when compared to various gauge needles like 23G (40%, $p=0.001$) and 25G (18.8%, $p = 0.02$), 27 G (14.28% $p = 0.03$), the use of smaller gauge needles (e.g.23G) was linked to a considerably higher PDPH incidence (40%, $p=0.001$). Previous research has shown that the incidence of PDPH is generally lower with smaller bore needles, variables like the kind of needle (atraumatic vs. cutting) and the practitioner's experience can have a greater impact on the results [26].

Although 15% of the study group had diabetes and 20% had hypertension, the study did not examine any correlation between PDPH and these conditions. According to earlier research, such as a study by Bezov et al., which found that patients with a history of migraine or tension headaches were more likely to develop PDPH following lumbar puncture, a history of headaches, which was present in 30% of the patients, may have predisposed these people to PDPH [27].

There is a positive relationship between dehydrated and rehydrated patient during 1st 48 hours of dural puncture. Dehydrated patient suffered from PDPH largely. Severity of dehydration during post puncture period also significant. Some sign of dehydration (30%, $p=0.04$) and severe dehydration (60%, $p=0.003$). This result reveled that more severity of dehydration during the post-operative period more the chance of development of PDPH.

Limitations of the Study

A modest sample size and a single hospital were used for the investigation. Thus, the outcomes might not be indicative of the entire community.

Conclusion

This study emphasizes age, gender, number of puncture attempts, needle size and hydration status of the patient as important variables linked to PDPH. A higher rate of perforation attempts, older age groups, females, and wide bore needles, dehydration during post-

operative period were all substantially associated with PDPH.

Funding
This research was funded by the authors themselves.

Conflict of Interest
The authors declare no conflict of interest.

Ethical approval
The study was approved by the Institutional Ethics Committee

Recommendation
In order to lower the risk of post-dural puncture headache (PDPH), it is advised to decrease the number of puncture attempts during spinal procedures and to take into consideration the use of larger gauge (27 G) needles. Post-operative fluid management should be meticulously maintained so that patient would not be suffered from dehydration Furthermore, since they may be more vulnerable, female patients and elderly patients should receive extra care. To effectively avoid PDPH, further study should be done on improving needle design and technique.

REFERENCES

1. *Bezov D, Lipton RB, Ashina S. Post-dural puncture headache: part I diagnosis, epidemiology, etiology, and pathophysiology. Headache: The Journal of Head and Face Pain. 2010 Jul;50(7):1144-52.*
2. *Davignon KR, Dennehy KC. Update on postdural puncture headache. International Anesthesiology Clinics. 2002 Oct 1;40(4):89-102.*
3. *Turnbull DK, Shepherd DB. Post-dural puncture headache: pathogenesis, prevention, and treatment. British journal of anesthesia. 2003 Nov 1;91(5):718-29.*
4. *Amorim JA, Maciel CM, Damazio OF, Aragao MF, Barros MV, Silva WF. Postdural puncture headache: pathophysiology diagnosis and risk factors. Rev Dor. 2007;8(2):1014-27.*
5. *Tohmo H, Vuorinen E, Muuronen A. Prolonged impairment in activities of daily living due to postdural puncture headache after diagnostic lumbar puncture. Anaesthesia. 1998 Mar;53(3):299-302.*
6. *Society IH. The international classification of headache disorders. cephalalgia. 2004;24(1):9-160.*
7. *DelPizzo K, Cheng J, Dong N, Edmonds CR, Kahn RL, Fields KG, Curren J, Rotundo V, Zayas VM. Post-dural puncture headache is uncommon in young ambulatory surgery patients. HSS Journal®. 2017 Jul;13(2):146-51.*
8. *Choi PT, Galinski SE, Takeuchi L, Lucas S, Tamayo C, Jadad AR. PDPH is a common complication of neuraxial blockade in parturients: a meta-analysis of obstetrical studies. InDatabase of abstracts of reviews of effects (DARE): Quality-assessed reviews [internet] 2003. Centre for Reviews and Dissemination (UK).*
9. *Vallejo MC, Mandell GL, Sabo DP, Ramanathan S. Postdural puncture headache: Anesth Analg. 2000 Oct;91(4):916-20.*
10. *Nath S, Koziarz A, Badhiwala JH, Alhazzani W, Jaeschke R, Sharma S, Banfield L, Shoamanesh A, Singh S, Nassiri F, Oczkowski W. Atraumatic versus conventional lumbar puncture needles: a systematic review and meta-analysis. The Lancet. 2018 Mar 24;391(10126):1197-204.*
11. *Khlebtovsky A, Weitzen S, Steiner I, Kuritzky A, Djaldetti R, Yust-Katz S. Risk factors for post lumbar puncture headache. Clinical neurology and neurosurgery. 2015 Apr 1;131:78-81.*
12. *Kuczkowski KM. Post-dural puncture headache in the obstetric patient: an old problem. New solutions. Minerva anestesiologica. 2004 Dec 1;70(12):823-30.*
13. *Lybecker H, Møller JT, May O, Nielsen HK. Incidence and prediction of postdural puncture headache A prospective study of 1021 spinal anesthesias. Anesthesia & Analgesia. 1990 Apr 1;70(4):389-94.*

14. *Amorim JA, Valença MM. Postdural puncture headache is a risk factor for new postdural puncture headache. Cephalalgia. 2008 Jan;28(1):5-8.*
15. *Ljubisavljevic S, Trajkovic JZ. Postdural puncture headache leads to clinical worsening of pre-existing chronic headache. Journal of Clinical Neuroscience. 2020 May 1;75:30-4.*
16. *Flaatten H, Rodt S, Rosland J, Vamnes J. Postoperative headache in young patients after spinal anaesthesia. Anaesthesia. 1987 Feb;42(2):202-5.*
17. *Albayram S, Asik M, Hasiloglu ZI, Dikici AS, Erdemli HE, Altintas A. Pathological contrast enhancement of the oculomotor and trigeminal nerves caused by intracranial hypotension syndrome. Headache: The Journal of Head and Face Pain. 2011 May;51(5):804-8.*
18. *Van Oosterhout WP, Van der Plas AA, Van Zwet EW, Zielman R, Ferrari MD, Terwindt GM. Postdural puncture headache in migraineurs and nonheadache subjects: a prospective study. Neurology. 2013 Mar 5;80(10):941-8.*
19. *De Almeida SM, Shumaker SD, LeBlanc SK, Delaney P, Marquie-Beck J, Ueland S, Alexander T, Ellis RJ. Incidence of post-dural puncture headache in research volunteers. Headache: The Journal of Head and Face Pain. 2011 Nov;51(10):1503-10.*
20. *Rochwerg B, Almenawer SA, Siemieniuk RA, Vandvik PO, Agoritsas T, Lytvyn L, Alhazzani W, Archambault P, D'Aragon F, Farhoumand PD, Guyatt G. Atraumatic (pencil-point) versus conventional needles for lumbar puncture: a clinical practice guideline. Bmj. 2018 May 22;361.*
21. *Uppal V, Russell R, Sondekoppam RV, Ansari J, Baber Z, Chen Y, DelPizzo K, Dirzu DS, Kalagara H, Kissoon NR, Kranz PG. Evidence-based clinical practice guidelines on postdural puncture headache: a consensus report from a multisociety international working group. Regional Anesthesia & Pain Medicine. 2024 Jul 1;49(7):471-501.*
22. *Martelletti P, Jensen RH, Antal A, Arcioni R, Brighina F, de Tommaso M, Franzini A, Fontaine D, Heiland M, Jürgens TP, Leone M. Neuromodulation of chronic headaches: position statement from the European Headache Federation. The journal of headache and pain. 2013 Dec;14:1-6.*
23. *Vallejo MC, Mandell GL, Sabo DP, Ramanathan S. Postdural puncture headache. Anesthesia & Analgesia. 2000 Oct 1;91(4):916-20.*
24. *Bezov D, Lipton RB, Ashina S. Post-dural puncture headache: part I diagnosis, epidemiology, etiology, and pathophysiology. Headache: The Journal of Head and Face Pain. 2010 Jul;50(7):1144-52.*
25. *Ahmed SV, Jayawarna C, Jude E. Post lumbar puncture headache: diagnosis and management. Postgraduate medical journal. 2006 Nov;82(973):713-6.*
26. *Turnbull DK, Shepherd DB. Post-dural puncture headache: pathogenesis, prevention and treatment. British journal of anaesthesia. 2003 Nov 1;91(5):718-29.*
27. *Bezov D, Ashina S, Lipton R. Post-dural puncture headache: Part II–prevention, management, and prognosis. Headache: The Journal of Head and Face Pain. 2010 Oct;50(9):1482-98.*