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A cross sectional study on prevalence of post dural puncture headache after cesarean section delivery under spinal anesthesia – In a tertiary center in Tripura

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Abstract

Background and Aim: Post-dural puncture headache (PDPH) is a well-recognized complication that occurs following intentional or accidental puncture of the dura-arachnoid membrane during procedures such as spinal anesthesia, diagnostic lumbar puncture, or epidural anesthesia. In obstetric practice, spinal anesthesia is widely used for cesarean sections; however, it carries a risk of PDPH, which can significantly affect maternal recovery and well-being. The present study was conducted to determine the prevalence of PDPH and to identify associated risk factors among women undergoing cesarean section under spinal anesthesia. ***Material & methods:*** This cross-sectional study was conducted in the Department of Obstetrics and Gynecology at a tertiary care center over a period of one year. A total of 100 patients undergoing cesarean section under spinal anesthesia were included based on predefined inclusion and exclusion criteria. Data analysis was performed using SPSS version 25.0. Both bivariate and multivariate logistic regression analyses were applied to identify associations between variables. A p-value of <0.05 was considered statistically significant. ***Results:*** Among patients who developed PDPH, the use of larger spinal needles (AOR = 8.2; 95% CI: 0.04–0.40; p = 0.001) and increased number of puncture attempts (AOR = 4.63; 95% CI: 0.56–37.12; p = 0.16) were identified as key factors associated with PDPH in multivariate analysis. ***Conclusion:*** The prevalence of PDPH observed in this study was higher compared to many previous reports. Larger needle size and multiple puncture attempts emerged as independent risk factors. Therefore, minimizing the use of larger gauge needles and reducing repeated dural punctures may help decrease the incidence and severity of PDPH.

Keywords: Cesarean Section, Post Dural Puncture Headache, Spinal Anesthesia, Spinal Needle.

INTRODUCTION

Regional anesthesia is widely preferred for cesarean delivery due to its safety profile, technical simplicity, reduced maternal morbidity, and effective postoperative analgesia. [1-3] However, post-dural puncture headache (PDPH), which is the iatrogenic cause of patient morbidity in contemporary anesthesia, has been an issue for patients adjacent to dural puncture as well as pain management medication following attempted epidural and spinal blocks.[2]. The postoperative headache may have an impact on new parent worries and family ties.[4]

Based on the criteria outlined in the International Classification of Headache Disorders, post-dural puncture headache (PDPH) is characterized by the onset of a headache within a period of five days following dural puncture. This headache intensifies when the individual assumes an upright position, but shows signs of improvement when lying down. Additionally, PDPH is often accompanied by symptoms such as neck stiffness, tinnitus, sensitivity to light (photophobia), and feelings of nausea. The phenomenon of spontaneous disappearance following an epidural blood patch might occur within a time frame of one week or as early as 48 hours. Commonly employed for management purposes are conservative therapy, including bed rest, water, and caffeine [5].

The reported incidence of PDPH varies widely in the literature, ranging from 0.3% to 40%. This variability is influenced by several procedural and patient-related factors such as age, body mass index (BMI), needle size and type, and number of attempts during spinal anesthesia. Among these, needle size and design are particularly important, as smaller diameter needles have been associated with a reduced incidence of PDPH. [6, 7] PDPH has been associated with many risk variables, including as age, weight, needle size and design, and the number of puncture attempts [8, 9].Furthermore, the size and

shape of the needle seem to have a significant impact on the occurrence of post-dural puncture headache (PDPH).The literature has demonstrated that decreasing the diameter of the spinal needle leads to a notable decrease in the occurrence of post-dural puncture headache (PDPH) [10].
Therefore, the present study was done to assess the prevalence and associated risk factors of PDPH after cesarean section delivery under spinal anesthesia.

MATERIALS AND METHODS

The present cross-sectional study was conducted in department of obstetrics and gynecology at a tertiary care center for a period of one year. Ethical permission was obtained from institutional ethical committee before commencement of study.
The study was conducted among 100 patients who were admitted to department for cesarean section on the basis of eligibility criteria decided for study. Patients having ASA status I-II after Cesarean Section done upon spinal anesthesia were included in the study. Uncooperative patients, patients with impaired cognitive ability and patients with eclampsia were excluded from the study.

The entire process was carried out while seated. Iodine and alcohol were used to clean the patients' behinds. A midline technique was used to administer 0.5% isobaric bupivacaine in doses ranging from 2.5 to 3.0 milliliters at the L2-3 or L3-4 interspaces. One of the data collectors could access each patient's chart and gather the intraoperative data. On days 1, 2, and 3, patients were questioned about their headaches' location, type, and duration as well as any accompanying symptoms such as nausea, tinnitus, partial hearing loss, neck stiffness, and photophobia. According to the diagnosis, PDPH met the following requirements.
Within three days of the dural puncture, the headache must appear. It must also worsen within 15 minutes of standing or sitting and improve within 15 minutes of lying down. It must also include at least one of the following symptoms: neck stiffness, tinnitus, hypoacusia, photophobia, and nausea.

Diagnostic Criteria for PDPH

- Onset within 3 days of dural puncture
- Worsening within 15 minutes of standing/sitting
- Relief within 15 minutes of lying down
- Presence of at least one associated symptom

Statistical analysis:

Data was analyzed in SPSS version 25.0 by using bi-variant and multi-variant logistic regression. Odds ratio with 95% confidence interval and p-value were computed to determine the strength of the association. A p-value less than 0.05 were considered as statistically significant.

RESULTS

Out of 100 patients, 75% belonged to the 18–30 years age group, while 25% were aged 31–45 years. The majority (86%) had normal BMI, and most patients (88%) were classified as ASA I as seen in table 1.

Table 1 shows demographic profile of patients

Variable	Frequency (%)
Age (in years)	
18-30	75 (75)
31-45	25 (25)
BMI	
<18.5 (underweight)	4 (4)
18.5-24.9 (normal)	86 (86)
>24.9 (overweight)	10 (10)
ASA status	
ASA I	88 (88)
ASA II	12 (12)

Among participants, 91% had no prior spinal anesthesia exposure, and only 1% had a previous history of PDPH. All procedures were performed in the sitting position. A single attempt was sufficient in 80% of cases, while multiple attempts were required in others. The most commonly used needle size was 23 gauge (78%). Neck stiffness and nausea were the most frequently reported associated symptoms as shown in table 2.

Table 2 shows spinal anesthesia related patterns of patients

Variable	Frequency (%)
Previous spinal anesthesia	
Yes	9 (9)
No	91 (91)
Previous history of PDPH	
Yes	1 (1)
No	99 (99)
Position of spinal anesthesia done	
Sitting	100 (100)
Lateral	0 (0)
Number of attempts	
Single	80 (80)
Twice	15 (15)
More than 2	5 (5)
Size of spinal needle	
23 gauge	78 (78)
25 gauge	14 (14)
26 gauge	8 (8)
Successful block	
Yes	98 (98)
No	2 (2)
Associated symptoms	
Neck stiffness	35 (35)
Tinnitus	1 (1)
Hyper accuses	3 (3)
Photophobia	4 (4)
Nausea	17 (17)
None	40 (40)

To determine if the model was suitable for analysis, the Hosmer-Lemeshow test of goodness of fit was carried out. The binary logistic regression revealed that the variables needle size and tries were significant. As shown in table 3, after analysis using multivariate logistic regression, the needle size and number of attempts were shown to be significant at p-value <0.05. The size of the spinal anesthetic needle is strongly correlated with the emergence of PDPH. In comparison to patients who underwent spinal anesthesia using smaller needles, people who underwent spinal anesthesia using larger spinal needles were more likely to develop PDPH. There was also a strong correlation between the number of attempts and PDPH. Patients who had multiple attempts at spinal anesthesia (SA) had a higher risk of developing PDPH than patients who only had one try.

Table 3 shows factors associated with PDPH

Variable	Syringe	PDPH		AOR (95%CI)	P value
		Yes	No		
Spinal needles	Big needles 23 G	40	38	8.2 (0.04-0.40)	0.001
	Small needles (25G, 26G)	7	15	1	
Attempt	Multiple	5	15	4.63 (0.56-37.12)	0.16
	Single	9	71	1	

DISCUSSION

PDPH remains a significant complication following spinal anesthesia, particularly in obstetric patients. The present study reported a relatively high prevalence (43%) compared to several previous studies, though similar findings have been reported in some settings. The higher prevalence observed may be attributed to the predominant use of larger gauge needles (23G) in this study. Larger needles create a wider dural defect, facilitating increased cerebrospinal fluid (CSF) leakage, which contributes to intracranial hypotension and headache. Additionally, multiple puncture attempts were associated with an increased risk of PDPH. Repeated dural trauma may exacerbate CSF leakage, further increasing susceptibility to PDPH. Although some studies have reported inconsistent findings, the trend observed in this study aligns with several previous investigations.

This study's 43% total postdural puncture headache rate is higher than other studies' reported rates done by Amoriam JA et al, Douglas MJ et al & Richman JM et al[11-13] but equivalent to a study done by Ali HM et al [14].The significant prevalence of PDPH in this study may be attributable to the fact that 78% of individuals underwent spinal anesthesia with a large spinal needle. In particular, when compared to small needles, the contribution of huge needles was highly associated with overall PDPH. Bigger needles are more likely than small needles to cause PDPH following spinal anesthesia (AOR= 8.2; p = 0.001). This may be related to the fact that larger needles created a wider hole in the dura, allowing more CSF to leak out than smaller holes created by smaller needles. Our results are consistent with other investigations.[15-18] Since all of the needle designs were Quincke types, we were unable to identify any connections between the outcome variable and the kind of needle design.

There was also a strong correlation between the quantity of efforts and the emergence of PDPH. With 79% of the initial efforts being successful, there is a lower risk of PDPH development than in patients who require additional attempts. Additionally, patients who made many attempts are more likely to develop PDPH than those who only made one attempt (AOR=4.54; p=0.16). This may be related to the quantity of attempts to increase the likelihood that continually piercing the dura would increase the volume of CSF leak, raising the likelihood of developing intracranial hypotension & PDPH. This result is consistent with prior research done by kuczkowski KM et al.[17] A population-based study conducted at the University of Basel, Switzerland, done by Seeberger MD et al [19] found that repeated spinal needle attempts were associated with PDPH claims in 4.2% of cases, which was somewhat lower than our study rate. Other research, however, did not find a strong correlation between the quantity of attempts and PDPH.[16,20,21]

The lower BMI, younger age, and a history of PDPH are identified as risk factors for the development of PDPH in several studies [16,22] but in our observational investigation, there was no evidence of a statistically significant relationship between these factors and PDPH. This might be as a result of the small sample size used to compare patients with and without prior PDPH histories, younger and older patients, and patients with lower to higher BMI. Our study does have certain limitations. The sample size wasn't big enough to account for needles of varying sizes (23G, 24G, 25G, and 26G). It was therefore impossible to ascertain the amount of PDPH in each little needle. Participants in our study were only monitored for three days. They might not experience PDPH until the seventh day after the dural puncture, which could underestimate the condition's general prevalence. Additionally, we did not look at how bad the headache was after the dural puncture.

Limitations

- Small sample size
- Short follow-up period (only 3 days)
- Inability to assess severity of PDPH
- Limited variation in needle types

CONCLUSION

In conclusion, PDPH prevalence was higher than in the majority of prior investigations. The study also revealed that large spinal needles and numerous failed attempts were two additional independent risk factors for PDPH. By limiting the use of large needles and frequent dura punctures, we advise reducing the larger magnitude of PDPH.

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