

## PREVALENCE AND ASSOCIATED RISK FACTORS OF POST DURAL PUNCTURE HEADACHE IN CAESAREAN SECTION PATIENTS UNDER THE SPINAL ANESTHESIA

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### Abstract

Post Dural Puncture Headache (PDPH) is a common complication following spinal anesthesia, particularly among patients undergoing cesarean section. PDPH arises due to cerebrospinal fluid (CSF) leakage from the dural puncture site, leading to decreased intracranial pressure and positional headaches. It can significantly affect maternal recovery, prolong hospital stays, and impact maternal-neonatal bonding. The primary aim of this study was to determine the prevalence of PDPH among cesarean section patients receiving spinal anesthesia with a 27-gauge needle. Additionally, the study sought to identify patient-related and procedural risk factors associated with the development of PDPH. A descriptive cross-sectional study was conducted at a tertiary care hospital in Peshawar over a four-month period (April to August 2025). A total of 184 female patients aged 18–45 years undergoing cesarean section under spinal anesthesia were included through non-probability sampling. Data were collected using a structured questionnaire and analyzed using SPSS version 26. Ethical approval was obtained from the institutional review board, and informed consent was secured from all participants. Out of 184 patients, 8 (4.34%) developed PDPH after receiving spinal anesthesia with a 27-gauge needle. The highest frequency of PDPH was observed among patients aged 39–46 years (5 cases), and those with a body weight between 76–83 kg (5 cases). Furthermore, 6 PDPH cases occurred in patients who received spinal anesthesia on the second attempt. No cases were reported among patients aged 18–25 years or weighing less than 69 kg. The data suggest that increasing age, higher body weight, and multiple puncture attempts are associated with an elevated risk of PDPH.

### INTRODUCTION

Post dural puncture headache (PDPH) is widely acknowledged and frequent following any procedure where dura mater, which is a protective covering to the spinal cord and the

brain, is punctured. This kind of headache is most often related to spinal anesthesia and diagnostic spinal taps and epidural anesthesia with the former being the most trifling in

practice (Zorrilla-Vaca *et al.*, 2018). Post Dural Puncture Headache (PDPH) is one of the major clinical issues, especially when spinal anesthesia is involved. It has been considered to be a headache that usually develops within five days after a dural puncture, and is worsened by standing or sitting, and alleviated when lying down (Weji *et al.*, 2020). PDPH is one of the known complications of spinal anesthesia and is associated with the presence of cerebrospinal fluid (CSF) outside its normal location due to a leakage of the dura mater conducted through the hole after a spinal needle (Li *et al.*, 2022). Not only is the state uncomfortable to the patient but it was also observed to increase length of stay and reducing early maternal-neonatal bonding on postpartum patients. Another effective and commonly used method of caesarean section birth is the spinal anesthesia (Batova & Georgiev, 2019). The typical description of PDPH is the positional headache with an increase in symptoms when the patient is sitting, and decreasing when the person is lying. Other symptoms that are associated might include headache, nausea, vomiting, neck stiffness, photophobia and tinnitus. In most cases, PDPH cannot be detected before 24 to 48 hours of the dural puncture and could take up to five days. Possibly, because PDPH is mildly primarily self-limited and tends to improve with time, its incidence can greatly affect the health potential and patient recovery (Lakhe *et al.*, 2023).

The condition also comes with higher health care expenses and extended days of hospitalization, making it a clinical issue in spinal access procedures. The approach offers quick anesthetic result, a high success rate, and eliminates risks of general anesthesia, including aspiration or infantile depression (Traynor, *et al.*, 2016). Although these are the benefits of spinal anesthesia, there are risks associated with the procedure whereby, the most common one is PDPH. The method is where a spinal needle is inserted through the dura mater in order to instill local anesthetic within the subarachnoid space. Although it is relatively safe, dural puncture can sometimes cause a continuous loss

of CSF, which increases the likelihood of getting it (Ali, Mohamed, & Ahmed, 2014).

PDPH incidence rates differ considerably in the literature, with various rates estimated between 0.1-36 percent, depending on needle type/size, patient population, and procedure technique. The risk may assume a high level in the case of young population, as well as in obstetric populations of females.

Technical (anatomical) causes and gender factors (Jensen *et al.*, 2018) Error Nam nodepow taskspi years sounds like hell Cannot expand the reference source.. These fluctuations in incidence denote the emergence of the context-specific research, in particular, in the resource-deprived environment where the equipment and the skill might differ (Demilew *et al.*, 2021). Presence of some risk factors had been identified in PDPH, and these factors include patient, procedural and anatomical. Among the risk factors related to the patients, there is a young age, female gender, low BMI, existence of headaches or migraines, and multiparity. Some of the procedural factors are the type and size of the needles (e.g. cutting vs. pencil-point) and the number of sticks, the bevel orientation, and the way a patient is positioned during procedure (Doelakeh & Chandak, 2023). The anatomical concerns such as smaller interspinous spaces and malformation of the spine curve also play a role in dural trauma and continued leakage of CSF (Zhao *et al.*, 2023).

## i Spinal Anesthesia

Spinal anesthesia refers to regional anesthesia whereby a local anesthetic is injected into the subarachnoid space and in most cases the lumbar region. This is the most common science employed in different type of surgery particularly procedures involving low abdomen, pelvis and lower extremities. The aim of spinal anesthesia will be to achieve blockade of sensory, motor and autonomic functions below a point of injection. The procedure can be deemed safe and effective with a quick onset and predictable action time (Jensen *et al.*, 2018). Spinal anesthesia is performed by inserting a needle into the lumbar area and delivering an anesthetic into the body

directly to the cerebrospinal fluid. Bupivacaine, ropivacaine, and lidocaine are the common medications administered as spinal anesthesia. These agents inhibit the conduction of nerve impulses through the spinal cord, and therefore, the desired anesthetic effect is attained (Al-Hashel *et al.*, 2022).

Although spinal anesthesia is effective and commonly employed in other surgical settings since it possesses a low risk of systemic complications, one of the possible side effects of spinal anesthesia is the occurrence of post dural puncture headache (PDPH). This complication occurs when this occurs during the procedure when the dura mater, a tough membrane covering the spinal cord, is penetrated, and the CSF leaks, causing symptoms to develop that are related to PDPH (Uppal *et al.*, 2023). Although the techniques and technologies of PDPH reduction have reached a high level, it remains a serious issue both to patients and clinicians.

## ii Risk Factors of Post Dural Puncture Headache

The effect of PDPH is especially critical in the Caesarean section patients. Such patients tend to be in the postpartum period and should start breastfeeding, take care of a newborn child, and recover after surgery (Vallejo & Zakowski, 2022). A crippling headache may significantly interfere with such activities and impact the maternal-infant bonds, mental health, and satisfaction with care in a negative way. In severe instances, PDPH might necessitate such procedures like epidural blood patch, which not only pose further risks to a patient but might not be available in low-resource facilities (Ljubisavljevic, 2020). It is imperative to understand the prevalence of PDPH and risk factors related to PDPH in patients receiving spinal anesthetic care during a caesarean section since this is necessary in supporting prevention strategies to assist in the delivery of better care to patients (Zhao *et al.*, 2023). In spite of these increasing numbers of publications on PDPH, there is still a lack of localized research to determine context-specific patterns, particularly in healthcare systems where the technique, training, and infrastructure are likely to differ. In addition, preventive

interventions, including smaller gauge, atraumatic needles, reducing the number of needling attempts, keeping patients well hydrated, and educated providers on the proper technique, has been shown to ameliorate the risk of PDPH (Dortz-Consski, 2022). No source found. At a specific period of time, relaxation time or stretch time is used to discuss the amount of time spent by the subjects inside and outside of the laboratory (Lakhe *et al.*, 2023). By predicting which patients are at greater risk, clinicians would have the possibility to take precautions ahead of time this might be through altered anesthesia practices or heightened observation. Cesarean section (C-section) is one of the most frequently used major surgical procedures in the world and spinal anesthesia is regularly administered during such a surgery. Nevertheless, C-section patients are at a higher risk of the development of post dural puncture headache (PDPH) due to the nature of the surgery and spinal anesthesia. The risk factors of PDPH in such patients are multifactorial in nature and the realization of any such factor(s) can help reduce the occurrence of this complication (Li *et al.*, 2022).

## Anatomical Considerations:

The main anatomical considerations that pose an increased PDPH risk in C-section patients is the pregnancy-induced altered anatomy. Pregnancy increases the intra-abdominal pressure, so there are alterations of lumbar spine and epidural space. This changed anatomy can make it harder to obtain the proper site of needle insertion, potentially making the insertion of the needle more traumatic and/or resulting in a larger puncture and a risk of CSF leak and PDPH (Al-Hashel *et al.*, 2022).

## Needle Characteristics and Technique:

Use of smaller (smooth) needle sizes eg 25- gauge needles are commonly favoured in C-section patients and the lower reported rate of PDPH. The technique of anesthesiologist is also significant to exclude the risk of PDPH. The preferred route in it is the midline approach

because it is more predictable and consistent in its results, although lateral route may also be utilised depending on patency. It is also possible to reduce the risk of a dural puncture that can lead to CSF leakage since one smaller needle insertion is used (Uppal *et al.*, 2023).

### Maternal Factors:

Maternal age, body mass index (BMI) and general health of the mother also contribute to the incidences of PDPH after SPINAL ANESTHESIA in carrying a child through C-section surgery. Those who are younger and slimmer with a lower BMI are more susceptible to PDPH due to their epidural space being narrower and more likely to cause a larger CSF leak to take place. In addition, patients who have previously had a migraine headache may be more vulnerable to PDPH because of the existence of pathophysiological processes that predetermine the presence of headaches (Chekol *et al.*, 2021).

**Obstetric Factors:** Along with the risk factors mentioned on individual identities, there are also obstetric factors that could predispose C-section patients to the occurrence of PDPH. The presence of multiple gestation, preeclampsia, or the induction of labor along with the use of forceps or vacuum in the birth process may increase the risk of events during the procedure, hence the higher rate of PDPH. Also, patients who receive C-section following a long childbirth experience or after a prior C-section can have a distorted or scarred epidural area, causing the dural puncture to be more traumatic and predisposing them to a higher risk of PDPH (Weji *et al.*, 2020).

**Postoperative Management:** Early mobilization and optimal hydration in a post-operative period are imperative in coping with the risk of PDPH following the use of spinal anesthesia. The symptoms of PDPH can be effectively worsened by dehydration and long stay in bed. In addition, pain management through pain reduction and the administration of analgesics is useful in a situation where escalation of pain should be prevented and the severity of headaches minimized (Li *et al.*, 2022).

### Study Design: METHODOLOGY

Descriptive Cross Sectional study

### Study Settings

Tertiary Care Hospital in district Peshawar

### Study Duration:

Duration of this research was 4 months w.e.f April 2025 to August 2025

### Sample Size:

The study sample size is calculated according to Cochran's Formula (because our population is unknown):

### Sampling Technique:

$$n_0 = (Z^2 * p * (1-p)) / E^2$$

total sample size: 184

Non-Probability Sampling Technique

### Sample Selection:

### Inclusion Criteria:

- Females patients undergoing caesarean section under spinal anesthesia during the study period.
- Patients aged 18 to 45 years.
- Patients who are conscious, oriented, and able to communicate symptoms postoperatively.
- Patients who consent to participate in the study.
- Patients available for postoperative follow-up for at least 5 days to monitor for PDPH symptoms

### Exclusion Criteria:

- Patients receiving general anesthesia or combined spinal-epidural anesthesia.
- Patients with a known history of chronic headaches, migraines, or neurological disorders.
- Patients with coagulation disorders or on anticoagulant therapy.
- Patients who experienced accidental dural puncture during epidural anesthesia (to isolate true spinal cases).
- Patients with incomplete medical records or those who were lost to follow-up within the first 5 postoperative days.

- Patients with multiple co-morbidities such as severe preeclampsia or infections that may confound headache assessment.

### Data Collection Procedure:

The data collection for this study was conducted following approval from the Institutional Review Board and the Ethical Committee of Sarhad Institute of Allied Health Sciences Peshawar. An ethical approval letter, signed by the research coordinator, was obtained prior to the commencement of the study. A structured questionnaire was used to gather data, which was divided into several sections. The first section covered demographic information. The second section focused on prevalence and associated risk factors of post dural puncture headache in caesarean section patients under the spinal anesthesia.

### Data Analysis Procedure:

After data collection process the gathered data was analyzed through SPSS (Statistical Package for Social sciences) version 26.

### Ethical Consideration:

Ethical considerations in this study was prioritize the protection and rights of all participants. Informed consent will be obtained from each participant before data collection, ensuring that they fully understand the study's purpose, procedures, potential risks, and benefits. Participants will be made aware that their involvement is voluntary and that they have the right to withdraw at any time without consequence. To ensure privacy, all collected data will be anonymized and confidentiality will

be maintained by securely storing data in password-protected files. The study will be designed to minimize any physical or psychological harm to participants, with non-invasive surveys and the option to withdraw if they experience any distress. Ethical approval will be sought from an institutional review board (IRB) or ethics committee to guarantee that the study complies with established ethical standards.

### RESULTS

A total of 184 patients were taken in our study. All of them were female and given spinal anesthesia with 27 gauge needle. PDPH developed in only 8 (4.34%) patient who were given spinal anesthesia with 27 gauge needle. Out of these 8 patients, who were feeling PDPH, 1 (0.54%) patient was feeling occipital headache after 48-72 hours of spinal anesthesia. Besides that 2 (1.08%) patients, aged 38 years, were suffering from generalized headache. Out of total 8 patients, 1 (0.54%) 45 years old patient suffered from occipital pain after 72 hours of spinal anesthesia. Besides that 6 (3.26%) patients suffered from occipital headache a <72 hours of spinal anesthesia. (Fig 1)

The mean age of the patients was 33 (17.93 %) years with range of 18-46 years. The mean weight of patients was 76 (41.3%) kg ranging from 55 – 90 kg. Out of 184 patients, 144 (78.3%) patients were given spinal anesthesia in first attempt, 38 (20.7%) patients were given spinal anesthesia on second attempt, 1 (0.54%) patient was given spinal anesthesia on third attempt and 1 (0.54%) patient on fourth attempt.

All baselines characteristic are given in Table 1.

Table 1: Baseline characteristics

Females	184	
27 gauge needle	184 (100.00%)	
PDPH with 27 gauge	8 (4.34%)	
Mean Age	33(18-46 years)	
Mean Weight	76 (55-90 Kg)	
No of attempts	First	144 (78.3%)
	Second	38 (20.7%)
	Third	1 (0.54%)
	Fourth	1 (0.54%)

Table 2: Respondents' Age with frequency of PDPH

Count		PDPH		Total
		PDPH	No	
Respondents Age	18-25 years	0	45	45
	25-32 years	1	54	55
	32-39 years	2	43	45
	39-46 Years	5	34	39
Total		8	176	184

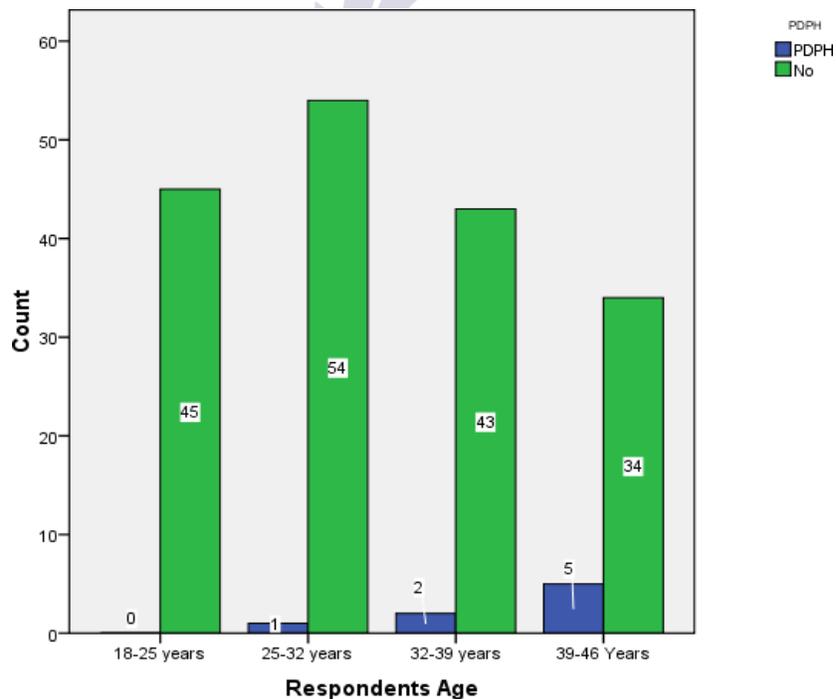


Figure 1: Bar Chart of Respondents' age with frequency of PDPH

The above figure shows that out of total 8 patients who were given spinal anesthesia with

27g needle, only 1 (0.54%) patient was in age group of 25-32 who was suffered with PDPH

after spinal anesthesia, on the other hand 2 (1.08%) were having age of 32-39 years were also suffered with PDPH. 5 (2.71%) was recorded in the patients who were in age of 39-46 years. It is also notable according to the above given table and figure in category of 18-25 years of age, there was no patient who were having PDPH problem. As the below given figure 2, reveals the age of the respondents with frequency of PDPH. It shows

that there was no case of PDPH in patients who are in weight category upto 55- 62 Kg and 62- 69Kg, while only 1 (0.54%) patient of weight upto69-76Kg, were suffered with PDPH. 5 (2.71%) patients of 76-81Kg, and 2 (1.08%) patients of 83-90Kg were having problem of PDPH after giving spinal anesthesia with 27g needle.

Table 3: Respondents' weight with PDPH Frequency

Count		PDPH		Total
		PDPH	No	
Weight of the respondents (Kg)	55-62 Kg	0	21	21
	62-69 Kg	0	45	45
	69-76 Kg	1	58	59
	76-83 Kg	5	29	34
	83-90 Kg	2	23	25
Total		8	176	184

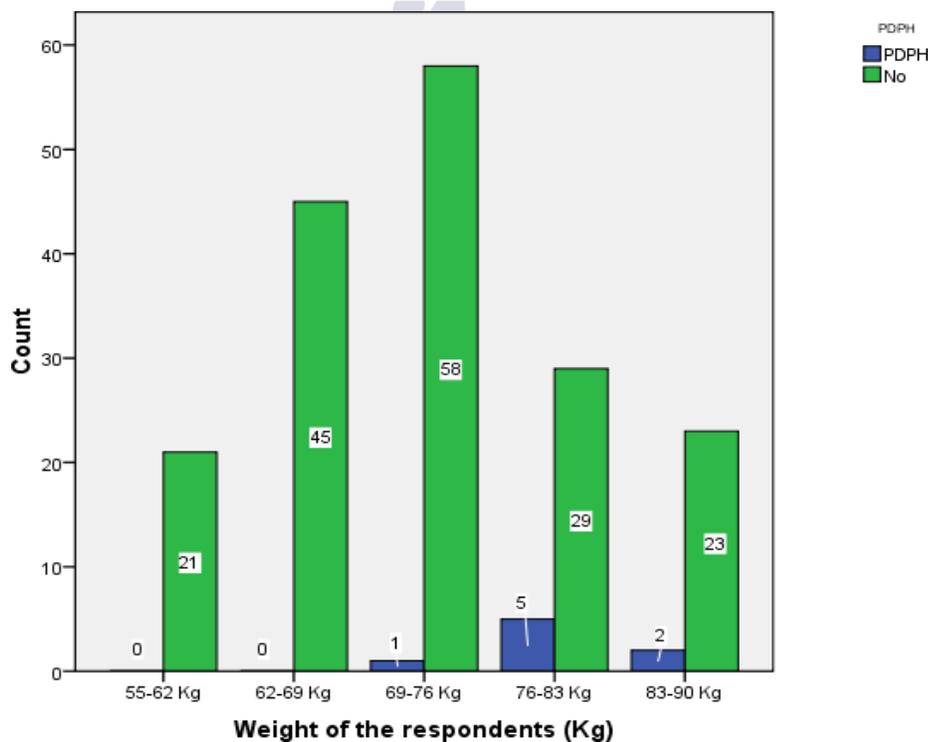


Figure 2: Respondents' weight with PDPH

The below figure shows that 176 patients 144 (78.26%) were given spinal anesthesia at 1<sup>st</sup> attempt and they were not having any problem of PDPH. While total 38 (20.65%) patients were given spinal anesthesia 2 times, out of these 38 patients 6 (3.26%) patients, were suffered with PDPH. Likewise,

only 1 (.54%) patient, who was 45 years old and her weight was upto 83Kgs, was suffered with PDPH. The same ratio i.e. 1 (0.54%) was recorded in 39 years old and 79Kg weight patient, who had attended >3 attempts, and felt occipital problem after >72hours of spinal anesthesia.

Table 4: Frequency of PDPH with no of attempts

Count		PDPH		Total
		PDPH	No	
No. of attempts	1st Attempt	0	144	144
	2nd Attempt	6	32	38
	3rd Attempt	1	0	1
	>3	1	0	1
Total		8	176	184

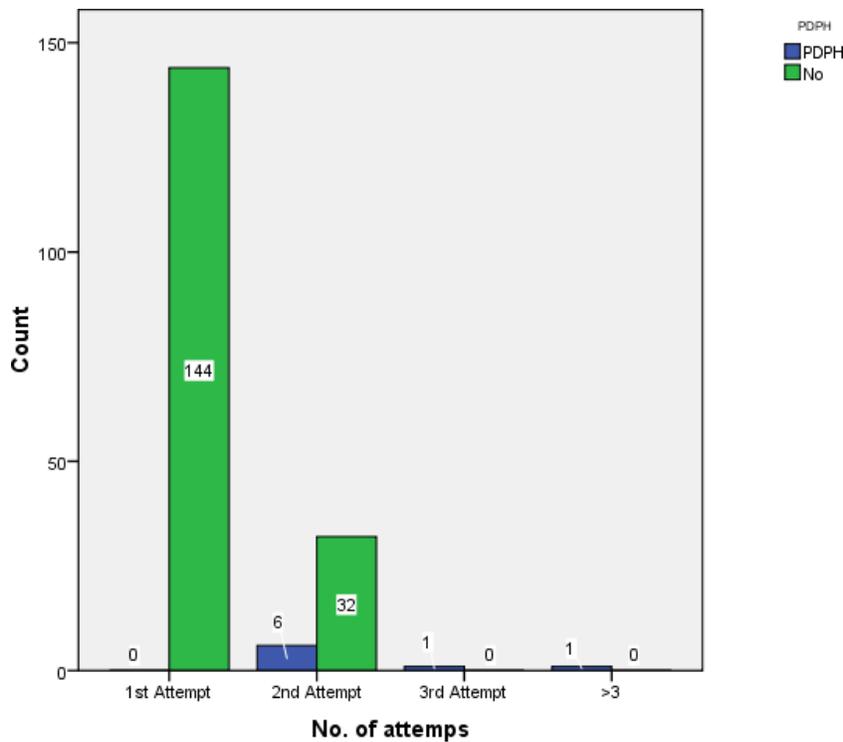


Figure 3: Frequency of PDPH with No. of attempts

DISCUSSION

In 1884, a Viennese ophthalmologist first introduced the use of topical cocaine for eye analgesia. Similarly, New York surgeon William

Halstead and Roosevelt Hospital's Richard Hall further promoted the idea of local anesthesia through surgical anesthesia with human tissue

and cocaine nerve injection. In 1885, New York City neurologist James Leonard Corning described spinal anesthesia with cocaine. The idea of using cocaine in the subarachnoid space arise from observing all of the infusions of Halstead and cocaine, as Corning has often observed at Roosevelt Hospital. The history of PDPH was recorded in 1899 by August Bier, who personally described his headache. Postural puncture headache (PDPH), also known as lumbar puncture headache (LP), is a common complication of subarachnoid block. Headache is usually a posture (deteriorates when standing, gets better at bedtime) and often involves stiff shoulders, photophobia, nausea or subjective hearing. PDPH is the commonest complication of spinal anesthesia. Onset of headache after dural puncture varies from 24 hours to 7 days (Gunaydin & Karaca, 2020), of which 90% of postdural headache occurs within 3 days after surgery (Muhammad *et al.*, 2021) 48% of patients within 48 hours begins the attack.

A total of 184 patients were taken in our study. All of them were female and given spinal anesthesia with 27 gauge needle. PDPH developed in only 8 (4.34%) patient who were given spinal anesthesia with 27 gauge needle. In our study the total no. of PDPH patients was 8 and there was 3 patients at the age of 39 years. So, our mean age is 39. And the rest of 5 patients were at different ages. In this study there were 5 patients above 80 Kg weight, so the mean weight was 82, while the mean attempts was 2.

In a study conducted where a total of 168 patients who underwent caesarean section with caesarean section 27G needle. The PDPH frequencies of 27G needle for spinal puncture was 3.7% (Farrukh *et al.*, 2019). Other scholars conducted a cross-sectional comparative study in the Department of Anesthesiology of the Institute of Kidney Diseases, recruiting hundreds of patients with ASA I and II status. In their study, they observed that the incidence of PDPH in the 27G needle group was 14.0% (Ranasinghe *et al.*, 2021).

In a study by Idris *et al.*, They examined 124 samples with 27G needles and found that the

incidence of PDPH was 3.2%, respectively (Idris, *et al.*, 2020). On the other hand Chekol *et al.* Used the Quincke No. 27 needle to examine the incidence of epidural puncture headache in patients undergoing elective hospital orthopedic surgery. The overall incidence of headache due to epidural puncture was 0.8% (Chekol *et al.*, 2021). According to several authors, the general incidence of headaches due to epidural puncture is 0% to 37%. However, in a study by Xu *et al.*, The incidence of PDPH was 0% in patients undergoing spinal anesthesia during caesarean section, using 27G Quincke spinal needles (Xu *et al.*, 2017). In a study conducted in Viitanenet, the incidence of all PDPHs was 8.5% (Ljubisavljevic, 2020).

## CONCLUSIONS

When a headache occurs in subarachnoid delay, it should be considered as a potentially serious symptom and should be distinguished from other headaches. PDPH is a complication that cannot be underestimated. Although PDPH is usually self-limited and not fatal, its postural properties prevent patients from performing routine activities. There is considerable variability in the incidence of PDPH. In our current study, we have an incidence of approximately 4.34%. We conclude that some factors seem to make it easier for patients to develop PDPH after spinal anesthesia, such as age, weight, number of attempts and needle size.

The incidence of PDPH is inversely proportional to the operator's experience, and if the anesthesiologist has experience, the probability of PDPH will decrease. In our study, we observed that the frequency of PDPH increased with increasing patient age and weight. The main cause of PDPH is the size of the dural perforation. Reduction of the needle size (G) for spinal anesthesia may be a reasonable way to reduce the incidence of headaches from postural puncture. In order to reduce the incidence of PDPH, precautions should always be taken such as a smaller needle size, the shape of the needle and the direction of the needle bevel associated with the hard fibers. In general, we conclude that when spinal anesthesia is performed during

caesarean section, 27G should be used with a clear advantage over other gauge needle in terms of PDPH frequency. Therefore, we recommend the routine use of 27G spinal needles during caesarean section anesthesia, because in experienced hands, 27G spinal needles can successfully perform a spinal block and reduce PDPH rates in caesarean sections.

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