

## Post Dural Puncture Headache: A Comparative Study Of 25g And 27g Spinal Needle In Caesarean Section

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**Abstract:** Postdural puncture headache (PDPH) particularly following caesarean section is a well-known iatrogenic complication of spinal anesthesia mostly occurs due to loss of cerebrospinal fluid (CSF) during the procedure. To reduce the sufferings, over last three decades, spinal needles have been modified and more refined and thinner needles of 25-31G have been used. Considering limited studies in this country, the study was planned to assess comparative superiority of 27G spinal needle over 25G in Caesarean Section for reduction of PDPH. The prospective, single blind, randomized study was conducted in Rangpur Medical College Hospital for 1-year period following ethical approval. Total one hundred full term primi-parous women aged within 18–36 years were selected according to the inclusion criteria. They were divided into two groups: group A & Group B, and scheduled to receive spinal anesthesia for elective CS. Patients were randomly assigned to receive spinal anesthesia with either 25G spinal needle (group A, n=50) or with 27G needle (group B, n=50). Women who had history of previous CS or lumbar puncture due to any cause, multiparous, and need emergency CS were excluded. Data collection was done focusing incidence of PDPH, onset, site, duration and severity of the headache post-operatively. Intraoperatively, difficulty in localizing the subarachnoid space and required time taken to administer spinal anesthesia were also recorded. Data analysis was done by SPSS 23. Irrespective of spinal needle, the overall incidence of PDPH of 100 CS patients was 17% and significantly higher incidence is noticed in group A than group B (26% vs 10%,  $p < 0.05$ ). Attempt required to attain CSF is higher in group B and finer needle takes significantly more time to collect CSF ( $p < .001$ ). Mean duration for CSF collection was  $35.08 \pm 13.43$  seconds (group A) and  $81.12 \pm 16.71$  seconds (group B). Use of 27G spinal needle will be a good choice for reduction of PDPH.

**Keywords:** Post dural puncture headache, complication of Spinal anesthesia, complications of lumbar puncture

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### I. Main Body

#### Background

Cesarean section (CS) under subarachnoid block (SAB) or spinal anesthesia is commonly practiced in all over the world, has shown several advantages over epidural or general anesthesia.<sup>1</sup> Unfortunately this procedure has some complications that may be severe enough to annoy the patient, surgeon and/or the anaesthetist.<sup>2</sup> Postdural puncture headache (PDPH) that can follow the spinal anesthesia, is the most frequent complication associated with this procedure.<sup>3</sup> PDPH was first described by Augustus Bier in 1898.<sup>4</sup> Since then it is a well-recognized, distressing problem, which may cause prolonged hospitalization and may require epidural blood patch.<sup>3,5</sup> An estimate suggests that, it is the third most common claim of obstetrics patients, accounting for 15% of the obstetric claims.<sup>1,6</sup> Besides this, reported PDPH incidence is ranged from 16%–86% of cases after attempted epidural block.<sup>5,7</sup> Even after a history of practicing spinal anesthesia over 100 years limited advancement has been achieved in completely preventing the occurrence of PDPH.<sup>8</sup>

Irrespective of methods either iatrogenic or spontaneous, any breach in the dura matter may result in PDPH. The signs and symptoms of PDPH mostly resulted from the loss of CSF<sup>9,10</sup>, which causes the tension of the cranial content eg. cerebral vessels and therefore reflex cerebral vasodilation.<sup>11,12</sup> However, it usually presents as a bilateral frontal or occipital headache immediately or within 24-48 h after the procedure.<sup>5,13</sup> Extensive review of the literatures suggested that few factors influence the increased incidence of PDPH. Among them age (younger age),<sup>2,3,14</sup> sex (7.4% for females vs. 3.4% for males),<sup>2,15</sup> pregnancy and previous

history of PDPH are few important factors.<sup>12,16</sup> Besides these, some modifiable risk factors like needle size, needle tip shape, bevel orientation and inserting angle to the dural fibers, stylet replacement, number of lumbar puncture (LP) attempts, midline versus lateral LP approach, type of local anesthetic solution, and clinical experience of the operator has important role in development of PDPH.<sup>2,3,10,12,17-20</sup> As PDPH develop due to leakage of the dural hole formed by the spinal needle, therefore, decreasing the size of the hole may be a logical solution to decreasing the incidence of PDPH, as suggested by different studies.<sup>1,21-23</sup> Over last three decades more refined and thinner needles of 25-31G sizes have been used to reduce the incidence of PDPH. In Bangladesh, 22G, and 25G needle are commonly used for obstetrics procedure particularly CS. But use of 27G is very much infrequent though scientific information suggest superior benefits over 22G and 25G spinocaine needle. Moreover, there is very limited studies underwent regarding this topics. Considering the facts, the study was designed to evaluate comparative superiority of 27G spinal needle over 25G in Caesarean Section for reduction of PDPH.

## **II. Materials and Methods:**

### **Design, subjects and Statistics:**

All women aged 18-36 year, primi-para, in term, single uncompromised fetus and uncomplicated pregnancy, admitted in Rangpur Medical College Hospital at department of Obstetrics & Gynecology from December, 2016 to November, 2017, were included into the study. Two groups were selected and denoted Group A and Group B. The women in both group were scheduled to received spinal anesthesia for elective CS and 25 G Spinocaine needle were used for group A, whereas 27 G needle were used for group B. Women were selected randomly by lottery methods where all had equal chances to enter each group. All patients were blind for the size of the needle used for spinal anesthesia. Patients with abnormalities of spine, soft tissue infection at the site of needle insertion, and/or coagulation disorders were excluded. Moreover, patient's factors like history of previous CS or lumbar puncture due to any cause, multiparous, pregnancy induced hypertension, required emergency CS (due to fetal distress or others), obesity (BMI>30), patients on anticoagulation therapy and concomitant respiratory tract infection or suffering from cardiovascular and neurological disorder were considered as exclusion criteria. Before inclusion, it was assured that they did not suffer from any kind of headache disorder.

All the patients were visited a day before surgery and were described about the study, study procedure and potential benefits and risks. They were assured that procedure of this study will not enhance the chance of postdural headache other than usual headache. All patients were subjected to a thorough and detailed history of present & past medical illness, past history of any surgical as well as anesthetic procedure along with detailed physical examination. Preoperatively, routine investigations like Complete Blood Count (CBC), ECG, serum creatinine, random blood sugar (RBS), serum electrolytes, and chest x-ray were done in each patients.

Blood pressure, heart rate and saturation estimation were done non-invasively half an hour before anesthetic procedure. Moreover, preloading by standard fluid were also done before surgery. With maintaining all aseptic precautions, spinal anesthesia procedure was performed in sitting position by the same anesthesiologist at L3-4 or L4-5 intervertebral space. The patients were given a standard spinal anesthetic consisting of 10–12.5 mg (2.0–2.5 ml) of 0.5% Bupivacaine in 8.25% dextrose (Hyperbaric Bupivacaine) and 25µg Fentanyl (total volume 2.5–3 ml) by either a 25Gx90 mm needle in group A, and 27Gx90 mm needle in group B. Spinal needles were introduced with the needle tip bevel directed laterally following standard sterilization and subcutaneous infiltration of skin by 2ml of 2% lidocaine, which was followed according to the methodology of the study by Mohammed EL et al.<sup>2</sup>

Following operative procedure, the patients was turned to the supine position with left uterine displacement. All patients were resuscitated and followed up cautiously during pre-operative, per operative and post operative period. Fall in systolic blood pressure below 100 mmHg or 20% of the baseline value was treated with rapid administration of i.v. fluids and 5–10 mg of Ephedrine given intravenously. Complications like nausea, vomiting, bradycardia, respiratory depression &/or skin reaction (i.e.; itching, erythema or pruritus) were managed symptomatically and injection metoclopramide, atropine, and pheniramine maleate was used respectively whenever required. The women were interviewed on days 1, 2, and 3 day postoperatively and were questioned about headache. Besides the information regarding incidence, onset of headache, severity, location, and duration, were assessed respectively. PDPH was defined as by the 'headache occurring within 5 days after lumbar puncture, and being aggravated when standing or sitting and relieved when lying flat' according to the definition of the International Classification of Headache Disorder, 3rd edition. Severity of headache was assessed on 1–4 scale.<sup>2</sup> (1) Mild headache which permitted long periods of sitting/erect position and no other symptoms. (2) Moderate headache, which made it difficult for the patient to stay upright for more than half an hour. It occasionally accompanied by nausea, vomiting, auditory and/or ocular symptoms. (3) Intense headache immediately upon getting up from bed, alleviated while lying horizontal in bed. Often accompanied by nausea, vomiting, ocular and auditory symptoms and (4) Headache that occurred even while lying horizontal in bed and

greatly aggravated immediately upon standing up, eating is impossible because of nausea and vomiting. PDPH was treated with bed rest, Diclofenac 75mg/3ml,i.m., good hydration, paracetamol (1gm twice or thrice daily) and/or Epidural Blood Patch (EBP).

Ethical issues were the prime concern of the investigators and it was maintained throughout the study period in according to the Helsinki declaration. Before that, formal ethical clearance was obtained from the ERC of RpMC. Intraoperative and post-operative evaluation were collected and kept recorded in separate case record form. Following collection of all the required data, these were analyzed by the SPSS/PC software 23. The study conducted with 95% confidence level at 5% acceptable error level and p value <.05 was considered as statistically significant. Unpaired *t* test and Chi-square test was used for analysis of continuous variables and categorical variables, respectively.

### III. Results:

Total 100 cases of Caesarian section were included in this study. Based on the needle used during spinal anesthesia they were divided into group A and group B. 25 G and 27 G needle was used for group A and group B respectively.

Age and weight distribution of pregnant mothers were almost similar in both groups and there was no statistical difference. Mean age of group A was 25.92±3.94 years and of group B was 26.56±3.83 years. Mean weight of the both groups were respectively 57.90±7.13 kg and 57.26±7.26 kg (Table 1).

Incidence of post-dural puncture headache (PDPH) was higher in Group A (25G) (26%) patients than Group B patients (27G) (10%) and incidence rate is significantly lower (p <0.05) in finer needle size. (Figure 1 & Table 1)

Onset, site, severity and duration of headache were comparable across groups. In group A headache took mean 23.75±10.00 SD hours to develop and in group B it was 15.60±11.23 SD hours. The most commonly identified site of headache was occipitofrontal (50%) in group A and occipital (60%) in group B. Fifty percent subjects of group A had moderate headache in comparison of group B (40%) (More illustrated in table 2).

Mean headache duration in both groups were varied and, majority subjects (41.7%) of Group A had headache duration between 49 to 72 hours. In addition, majority in-group B (60%) had headache duration between 49 to 72 hours (See table 2).

Of all, 22% subjects of group A, needed more than one trial to administer spinal regional anesthesia. Whereas, in-group B, 40% subjects needed more than one trial (p 0.05). Significantly, more time was required to get CSF in group B than in group A. Time to get CSF in group A was 35.08±13.43 seconds and in group B 81.12±16.71 seconds. (See table 3).

### IV. Discussion:

Post-dural puncture headache (PDPH) is a common complication associated with spinal anaesthesia. A review article on headache following spinal anaesthesia documented an incidence of PDPH ranging from 0.3 to 20% in spinal anaesthesia and upto 70% after accidental dural puncture during epidural anaesthesia.<sup>25</sup> PDPH occurs due to CSF leakage which exceeds CSF production.<sup>26</sup> The amount of CSF leakage is directly proportional to the size of dural leakage.<sup>27</sup> Therefore, among other factors needle diameter that pierces the dura mater was found to be an important factors influencing incidence of PDPH.<sup>5</sup> Also, parturient women are considered at increased risk for PDPH.<sup>26</sup> This study was designed to find out the differences in incidence of PDPH after spinal anesthesia during Caesarian Section using 25 G (Group A) and 27 G (Group B) Quincke spinal needles.

Age distribution of pregnant mothers was similar across groups. The mean age of subjects in group A and group B was 25.92±3.94 years and 26.56±3.83 years respectively. Mohammed E L and El Shal S M in a comparable study used 22G, 25G and 29G needles in three groups of parturient mothers. They reported a mean age of 27.8±5.7 years, 27.3±4.9 years and 27.6±5.0 years respectively in the former mentioned needle groups.<sup>2</sup>

The average weight in group A and B was found 57.90±7.13 kg and 57.26±7.26 kg respectively.<sup>28,29</sup> Comparable mean weight in obstetric patients were reported by other studies. Interestingly higher weight in relation to height was found to be associated with low risk of PDPH.<sup>26</sup>

Incidence of PDPH was significantly high in cases where the 25G needle (26%) was used compared to cases where 27G needle (10%) was used (p <0.05). This is consistent with findings of other similar studies. Wadood et al.<sup>12</sup> reported an incidence of 30.0% in 25G needle group compared to 14.0% in 27G needle group. Shah et al.<sup>27</sup> reported an incidence of 20% in 25G needle group and 12.5% in 27G needle group. This conforms to the fact that needle size along with type are important documented factors in PDPH.<sup>26,30,31</sup>

Onset, site, severity and duration of headache varied across studies involving comparison of different size needles.<sup>2,12,28</sup> Most of them reported minor and statistically non-significant differences across comparisons groups. This implies that these variable did not differ much with use of different needles.

Number of trials for a successful needle prick was found high in 27G spinal needle groups. Forty percent patients in this group required more than one trial. Whereas, patients in 25G group required multiple trials in 22% cases. Time to get CSF fluid was also found to be statistically significantly higher in group B (27G) compared to group A (25G). These findings, supported by other studies<sup>2</sup>, indicate that small bore needles, although lowers the incidence of PDPH, have high failure rate, takes longer time to get CSF and prolongs anaesthetic injection times. These could be attributed to decreased internal diameter of the more fine needles which provide increased resistance to CSF fluid as well as local anesthetic agents.

## V. Conclusion:

In conclusion, the study suggest that finer needle size like 27G is more effective than 25G for reduction of post dural puncture headache. Moreover, it is technically more time consuming to administer spinal anesthesia with a 27G needle than other. However, as patient's well-being and comfort is the first priority, therefore, use of 27G is recommend for spinal anesthesia during any surgical procedure and diagnostic technique.

## Limitation of the study

The study had several limitations. First, the sample size was not so big. Besides this, all sample were collected in only one center and male-female variation, and within different age range was not assessed in this study. Moreover, there was no scope to test the incidence of post-dural puncture headache within variation of same needle size with different tip. And lastly, long term follow up was not done which was most due to low resource of the patients and lack of fund.

## List of abbreviations:

CS- Cesarean section  
CSF- cerebro-spinal fluid  
LP- Lumbar puncture  
PDPH-Postdural puncture headache  
SAB-Subarachnoid block  
SD-Standard Deviation  
SPSS-Statistical package for social science

## VI. Declarations:

### Ethical Consideration

The researcher was duly concerned about the ethical issues related to the study. Formal ethical clearance was taken from the ethical review committee of the Rpmcfor conducting the study. Formal written consent was taken from the patient. And throughout the study, confidentiality was maintained properly.

**Consent Of Publication:**Not applicable

**Availability of data and material:** Data and materials supporting our findings in the manuscript will not beshared. It was not in accordance with participants' verbal consent

**Competing Interests:**The authors declare that there is no conflict of interests regarding the publication of this paper.

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### Author Contributions:

MAR conceive and developed the concept of the study. Conception and design of this Research were made by MAR and TAT. MAR and MJH wrote the first draft of the manuscript and TAT as well as ASK reviewed the draft.All authors read and revised the article and MAR approved the final manuscript.

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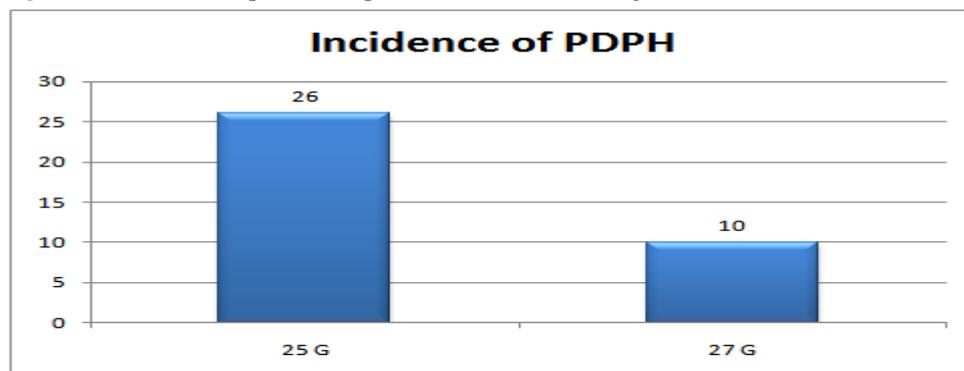
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### 13. Figures And Tables:

**Figure 1.** Incidence of post-dural puncture headache among the caesarean women (n=100)



**Table 1. Age and weight of patients**

Variable	Group A (25G) (n=50)	Group B (27G) (n=50)	P value
Age (years) [Mean ±SD]	25.92 ±3.94	26.56 ±3.83	.41
Weight (kg) [Mean±SD]	57.90±7.13	57.26±7.26	.66

**Table 2. Incidence and other information related to post-dural puncture headache (PDPH)**

Variable	Group A (25G)	Group B (27G)	p value
Incidence, n (%)	12 (26)	5 (10)	0.04
Onset: (h), mean (SD) range	23.75 (10.00) 10 – 43	15.60 (11.23) 7 - 34	0.16
Site of headache, n (%)			
Occipital	4 (33.3)	3 (60.0)	0.49
Occipitofrontal	6 (50.0)	1 (20.0)	
Frontal	2 (16.7)	1 (20.0)	
Severity of headache, n (%)			
Mild	4 (33.3)	2 (40.0)	0.81
Moderate	6 (50.0)	2 (40.0)	
Intense	1 (8.3)	1 (20.0)	
Headache while lying in bed	1 (8.3%)	(0)	
Duration (hours): n (%)			
≤ 24 hours	2 (16.7)	0	0.64
25 – 48 hours	4 (33.3)	1 (20.0)	
49 – 72 hours	5 (41.7)	3 (60.0)	
>72 hours	1 (8.3)	2 (20.0)	

**Table 3. Number of trials and time to get CSF during spinal anesthesia**

Variable	Group A (25G) (n=50)	Group B (27G) (n=50)	p value
Number trials needed n (%)			
One	39(78)	30(60)	.05
More than one (>1)	11(22)	20(40)	
Time to get CSF (sec): mean (SD)	35.08 (13.43)	81.12 (16.71)	<0.001

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