

## Original Research Article

# Comparison of post-dural puncture headache incidence among patients undergoing spinal anaesthesia for elective caesarean section by using quincke 25-G and 29-G spinal needles

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## ABSTRACT

**Background:** Multiple complications including hypotension, nausea, vomiting, urinary retention, transient neurological symptoms and headache have been associated with spinal anaesthesia. Importantly, post dural puncture headache (PDPH) varies with the type and size of spinal needle employed for inducing anaesthesia. Here, we aimed to compare the frequency of PDPH in patients underwent spinal anaesthesia for elective caesarean section using 25-gauge (G) and 29-G Quincke spinal needle.

**Methods:** We designed a randomized control trial at Obstetrics and Gynecology Operation Theatres, Jinnah Hospital, Lahore. A total of 152 patients having age  $30.28 \pm 8.21$  years were enrolled in the study and divided into two groups each comprising of 76 patients. In group 1, spinal anaesthesia was performed using 25-G Quincke spinal needle while in group 2 spinal anaesthesia was administered employing 29-G Quincke spinal needle. A standard dose of 10.5-12.0 mg (1.4-1.6 ml) of 0.75% bupivacaine is infiltrated in subarachnoid space at lumbar region L3-L4 or L4-L5 following aseptic measures. The patients were evaluated for PDPH during the follow up period.

**Results:** The previous history of PDPH was observed in 20.39% patients. The comparative study showed that the PDPH was observed in 12 (15.7%) patients in group 1 while the group 2 revealed PDPH in only 2 (2.6%) patients.

**Conclusions:** Thus 29-G spinal needle can be regarded as a better option to reduce PDPH in patients subjected to spinal anaesthesia for elective cesarean in contrast to the use of 25-G Quincke spinal needle.

**Keywords:** Spinal anesthesia, Elective cesarean, Post dural puncture headache

## INTRODUCTION

Sub arachnoid block has been in use for decades for surgeries below level of umbilicus. There are various complications associated with sub arachnoid block ranging from hypotension to neurological deficit but major disturbing complication that is encountered in daily practice is headache.<sup>1</sup> Headache most of the time occurs in spinal anaesthesia secondary to Dura puncture. Thus post dural puncture headache (PDPH) is an iatrogenic complication of spinal anaesthesia.<sup>2</sup> The mechanism

underlying headache is loss of cerebrospinal fluid through dural hole that leads to traction on cerebral contents and dilation of intra cranial vessels.<sup>3,4</sup>

There are variety of factors contributing to PDPH including age of the patient, gender, previous history, gauge (G) of spinal needle, type of spinal needle, pregnancy, orientation of needle to dural fibers and expertise of administrator.<sup>5-7</sup> In our settings, mostly spinal anaesthesia is administered employing Quincke needles. About 31.7% incidence of PDPH has been reported using

22 gauge needle.<sup>9</sup> Further, using 25 gauge Quincke needle, chances of PDPH has been reduced to 14.5%. and even 3.2% with 27 gauge needles.<sup>8</sup> It is important to note that increased incidence of failure of spinal anaesthesia employing 27 gauge (G) has been documented in contrast to 25-G needle i.e. 20% versus 6% respectively.<sup>21</sup>

It is well documented that PDPH is one of the frequently encountered complication of sub arachnoid block and multiple studies have suggested the use of smaller caliber spinal needle in reducing the incidence of PDPH. Mohammad and colleagues reported 11.7% frequency (7 out of 60 patients) of PDPH using 25-G needle in patients subjected to spinal anaesthesia whereas no incidence of PDPH was observed in 60 patients using 29-G spinal needle in full term pregnant patients subjected to spinal anaesthesia.<sup>9</sup> Here, we report a comparative analysis of the 25-G and 29-G Quincke needle mediated incidence of PDPH in pregnant females subjected to spinal anaesthesia for elective caesarean section in last 5 years at Jinnah Hospital, Lahore Pakistan.

## METHODS

Following approval from the ethical committee of Allama Iqbal Medical College/Jinnah Hospital Lahore, a randomized control trial was performed at Obstetrics and Gynaecology Operation Theatres, Jinnah Hospital, Lahore to compare frequency of post-dural puncture headache (PDPH) in patients undergoing spinal anaesthesia for elective caesarean section using 25-G versus 29-G Quincke spinal needle for 06 months i.e. September 2019 to March 2020.

In total, 152 patients were included in the present study according to patient enrollment criteria. The patients were divided into two groups, each comprising of 76 patients. Inclusion criteria of patients include all the female patients of ASA II age below 45 years undergoing elective caesarean section procedure. ASA III and IV patients, patient undergoing emergency cesarean section, soft tissue infection at the site of needle insertion, coagulopathy, hypovolemia, previous history of headache, abnormalities of spine, and patients with increased intracranial pressure were excluded from study.

Pre-operative evaluation and informed consent was taken. Demographic details of the patients including age, gender, previous history of PDPH and body mass index was noted. Patients were arbitrarily allocated into two groups. In group 1, spinal anaesthesia was performed using 25-G Quincke spinal needle while in group 2 spinal anaesthesia was administered employing 29-G Quincke spinal needle. Intra operative monitoring was done by pulse-oximeter, three lead ECG and non-invasive BP monitors. Patients in both groups were preloaded with 15 ml/kg of lactated ringer solution over the period of 30 minutes. Sub arachnoid block was performed in sitting position by consultant anaesthesiologist at the level of L3-L4 or L4-L5 interspace by using median or paramedian approach.

Standards anaesthesia dose of 10.5-12.0 mg (1.4-1.6 ml) of 0.75% bupivacaine is injected in subarachnoid space by either 25-G Quincke needle in group 1 or 29-G Quincke needle in group 2.

After taking aseptic measures, local anaesthetic of 2% lignocaine was infiltrated subcutaneously at L3-L4 or L4-L5 intervertebral space. After waiting for 30 seconds, spinal needles were introduced with the needle tip bevel directed laterally parallel to dural fibers. As soon as flow of cerebrospinal fluid (CSF) is seen in hub of spinal needle appropriate amount of drug is introduced after repeated aspiration. After withdrawal of the needle, the patient was turned to the supine position. Patient was monitored intra operatively in accordance with ASA standards. All the surgeries were done by gynaecology department and post-operative care was given as per protocols of the department. All the patients in both groups were assessed at hourly interval during 6 and 12 hours after the surgery for PDPH. All data were documented using Performa.

## Statistical analysis

The collected data was analysed using SPSS version 20. Mean and standard deviation was calculated for quantitative values like age and BMI. Frequencies and percentages were calculated for qualitative variables like previous history and incidence of PDPH. The incidence of PDPH was compared in both groups using Chi square test. Data was stratified for effect modifiers including age, previous history of PDPH and BMI. Post-stratification, Chi-square test was applied taking  $p < 0.05$  as significant.

## RESULTS

We performed a comparative analysis of the 25-G and 29-G Quincke needle mediated incidence of PDPH in pregnant females subjected to spinal anaesthesia for elective caesarean section in last 5 years at Jinnah Hospital, Lahore Pakistan.

**Table 1: Frequency distribution of previous history of post dural puncture headache (PDPH) between study groups.**

Previous history of PDPH	Study groups		Total
	25-G	29-G	
Yes	15	16	31
	19.7%	21.1%	20.4%
No	61	60	121
	80.3%	78.9%	79.6%

A total of 152 patients were enrolled in this study. The mean age of the patients was  $30.28 \pm 8.21$  years. In patients subjected to anaesthesia using 25-G needle, the mean age of the patients was  $29.08 \pm 7.61$  years while in anaesthesia injected patients using 29-G needle, the mean age of the patients was  $31.49 \pm 8.65$  years.

**Table 2: Comparison of post PDPH between study groups.**

		Study groups		Total	P value
		25-G	29-G		
PD PH	Yes	12 15.7%	2 2.6%	14 9.2%	<0.001
	No	64 84.2%	74 97.4%	138 90.7%	
Total		76 100.0%	76 100.0%	152 100.0%	

**Table 3: Comparison of PDPH between study groups stratified by age.**

Age (years)	PDPH	Study groups		Total	P value
		25G	29G		
≤ 30	Yes	4 11.1%	2 6.1%	13 17.1%	0.025
	No	32 88.8%	31 93.9%	63 82.9%	
>30	Yes	8 20%	0 0.0%	10 13.2%	<0.001
	No	32 80%	43 100.0%	66 86.8%	

The previous history of PDPH was noted in 31 patients (20.39%). In group 1 (patients subjected to anaesthesia using 25-G needle), the previous history of PDPH was noted in 15 (19.7%) patients whereas group 2 (patients subjected to anaesthesia using 29-G needle), the previous history of PDPH was noted in 16 patients (21.1%) (Table 1). The mean BMI of the patients was 27.23±3.71 kg/m<sup>2</sup>. In group 1 (patients subjected to anaesthesia using 25-G needle), the mean BMI of the patients was 26.57±3.58 kg/m<sup>2</sup> while in group 2 (patients subjected to anaesthesia using 29-G needle), the mean BMI of the patients was 27.89±3.73 kg/m<sup>2</sup>. Further, in group 1 (patients subjected to anaesthesia using 25-G needle), the PDPH was observed in 12 (15.7%) patients whereas in group 2 (patients subjected to anaesthesia using 29-G needle), the PDPH was noted in 2 (2.6%) patients (Table 2). The group 2 (patients subjected to anaesthesia using 29-G needle) showed statistically significant (p<0.001) lower PDPH as compared to group 1 (patients subjected to anaesthesia using 25-G needle). In addition, the comparison of PDPH between study groups revealed no PDPH case in patients with age >30 from group 2 (Table 3). Next, we performed a comparison of PDPH between study groups stratified by previous history of PDPH. The results showed that in patients with previous history of PDPH, no PDPH case was observed in group 2 (patients subjected to anaesthesia using 29-G needle) (Table 4).

In patients having BMI ≤ 25 kg/m<sup>2</sup> from group 1, the PDPH was observed in 9 (30%) patients whereas in group 2 patients, the PDPH was noted in 1 (4.8%) patient. Similarly, in patients having BMI >25 kg/m<sup>2</sup>, in group 1, the PDPH was observed in 12 (26.1%) patients whereas in group 2, the PDPH was observed in 1 (1.8%) patient. These data show significant reduction in the incidence of PDPH using 29 gauge spinal needle in patients undergoing spinal anaesthesia for elective caesarean section.

**Table 4: Comparison of PDPH between study groups stratified by previous history of PDPH.**

Previous history of PDPH	PD PH	Study groups		Total	P value
		25G	29G		
Yes	Yes	4 26.7%	0 0%	4 12.9%	0.027
	No	11 73.3%	16 100%	27 87.1%	
No	Yes	17 27.9%	2 3.3%	19 15.7%	<0.001
	No	44 72.1%	58 96.7%	102 84.3%	

**DISCUSSION**

The mechanism lying behind PDPH is persistent leakage of CSF through dural hole resulting in reduced intracranial pressure of cerebrospinal fluid and traction on cranial contents.<sup>10</sup> The compensatory mechanism of choroid plexus to produce increased cerebrospinal fluid is not enough in comparison to cerebrospinal fluid that is being lost.<sup>11</sup> Moreover negative pressure of epidural space also favors leakage of CSF. The above mentioned factors result in low intracranial pressure of CSF which is compensated by increase in cerebral blood volume by vasodilation of cerebral vessels in accordance with ‘Monro Kellie Doctrine’.<sup>12</sup> Thus PDPH is mostly associated with sub arachnoid block secondary to dural puncture and results in debilitating positional headache that manifests itself within 24 hours of block. PDPH is a treatable complication that should not under rated.

The chances of developing headache after spinal anaesthesia ranges from <3% to 75%.<sup>13</sup> There are variety of factors that contribute to this headache but most important of them are guage of needle and type of needles used. The incidence of headache increases with low guage of needle that is 22 guage. Similarly pencil point needles have reduced chances of headache as compared to cutting needles.<sup>14</sup>

It is important to note that 29-G needle group showed significantly lower PDPH cases in contrast to 25-G needle group. Our results are in line with the published data.<sup>9</sup> Previously, EL Mohammad and colleagues reported the frequency of PDPH in 7 patients (11.7%) out of 60 in those undergoing spinal anaesthesia using 25-G spinal needle while no PDPH case was observed in 60 patients (0%) undergoing spinal anaesthesia by 29-G spinal needle.<sup>9</sup> The study documented by El Mohammad included full term pregnant patients undergoing spinal anaesthesia only.<sup>9</sup>

In a prospective study, Eskander and colleagues compared incidence of post dural puncture headache with same gauge Quincke needle and pencil point needle. In his study, they used 25-G needles and classified PDPH into mild, moderate and severe. They further documented incidence of headache was lower with pencil point needles.<sup>15</sup> Similarly a study by Mehraj and colleagues documented that 25-G pencil point needle Whitacre cause less headache as compared to 25-G Quincke needle.<sup>16</sup> In another study that was observational cross section study conducted by Meshram and coworkers in which they reported only 1.2% incidence of post dural puncture headache and found there is not much role of gauge of spinal needle in post spinal headache.<sup>17</sup> Zorilla Vaca and colleagues performed a meta-analysis of randomized control studies to evaluate association of needle sizes and types with post dural puncture headache. They concluded pencil point needles are associated with decreased incidence of headache irrespective of their sizes while cutting type needles have significant association with post dural puncture headache and needle gauges.<sup>18</sup> In above mentioned studies, although the use of pencil point needle is advocated however, the major obstacles of their use in Pakistan include availability and expensive.

Rahman and coworkers compared incidence of post dural puncture headache in group using 25-G Quincke needle for spinal anaesthesia with a group of patients in which 27-G Quincke needle was used. They found incidence of headache 16.7% in 25 gauge patients and 6.7% in 27 gauge patients.<sup>19</sup> Another study conducted by Anirudh and colleagues reported 26% incidence of PDPH using 25-G Quincke needle as compared to 27-G needle in full term parturients admitted for elective caesarean section.<sup>20</sup>

Anisul Islam documented 12% incidence of post dural puncture headache in 25-G Quincke group and 2% in the 29-G Quincke group while incidence of failure of spinal anaesthesia was more with 27-G needle as compared to 25 gauge i.e. 20% versus 6%.<sup>21</sup> In a controlled study, Flatten and colleagues described a decrease in occurrence of headache from 10% to 0% employing 29-G spinal needle for spinal anaesthesia instead of 27-gauge needle in non-obstetric patients. Our results are in line with this report.<sup>21</sup> The major limitation of the present study includes the management of post dural puncture headache is not included in this study.

## CONCLUSION

In conclusion, the data show significant reduction in the incidence of PDPH using 29-G spinal needle in parturients undergoing spinal anaesthesia for elective caesarean section. The increase in needle gauge decreases the frequency of having PDPH, therefore the needle gauge is inversely proportional to incidence of having PDPH. Hence, our results strongly suggest that smaller gauge of spinal needles should be used to administer spinal anaesthesia in pregnant patients undergoing caesarean section.

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