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Postdural puncture headache incidence with 25G and 27G Quincke needles after spinal anesthesia for elective cesarean section

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ABSTRACT

Background: Post dural puncture headache(PDPH) is a bilateral occipito-frontal headache occurs in 0.1 to 36% of cases receiving spinal anesthesia. We evaluated the incidence of PDPH after spinal anesthesia using two commonly used needles, 25G and 27G Quincke needles among females undergoing elective cesarean section. **Aims and Objectives:** The aim of the study was to compare the post-dural puncture headache with 25G And 27G Quincke Needle – in terms of Incidence, severity in patients after spinal anesthesia for elective caesarean section and to find out number of attempts for successful block and any associated complications. **Materials and Methods:** Six hundred females of ASA grade I or II posted for elective cesarean section under spinal anesthesia were enrolled into two equal groups to assess incidence of PDPH in the post-operative period. They were assessed by a blinded observer for the onset of headache, characteristics, duration, severity, and any associated symptoms for 5 days. PDPH was defined as postural headache that was aggravated by sitting or standing position and relieved by lying supine. **Results:** The incidence of PDPH was 11% in 25G needle group and 6.33% in the 27G needle group [Risk Ratio of 0.58 (95% CI: 0.34, 0.99)]. In none of the groups, intensity of headache was severe while all were mild in the 27G group. Nausea and vomiting were the only associated symptomatology, 7.33% in the 25G group and 5.67% in the 27G group. **Conclusion:** The results support 27G Quincke needle to administer spinal anesthesia in females undergoing elective cesarean section.

Key words: Spinal anesthesia; Quincke needle; Headache; Cesarean section; Postdural

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INTRODUCTION

Spinal anesthesia is a standard anesthetic procedure for cesarean section due to rapid onset of dense block, avoidance of intubation or aspiration of gastric contents, avoidance of depressant agents, reduced blood loss, and moreover less procedural failure.[1] Postdural puncture headache (PDPH) remains a well-recognized complication with incidence varying from 0.1% to 36%.[2] PDPH is a mild to severe debilitating headache that occurs usually 2–3 days after dural puncture. It is characterized by a bilateral fronto-occipital headache, which radiates to neck and shoulders, exacerbated with sitting, standing, coughing, or straining but relieved on assuming a lying down or prone position.[3] It may be associated with nausea (up to 60%), vomiting, tinnitus, hearing loss, dizziness and paresthesia of scalp, photophobia, or diplopia.[4]

Young age, female sex, pregnancy, and prior history of headache believed to be the demographic risk factors, while large bore cutting spinal needle and number of attempts are well known iatrogenic causes of PDPH. After tip design, needle gauge is considered to be next important factor, which may predispose to PDPH.[5]

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In this study, we aimed to assess the incidence of PDPH in our institution, its severity and the associated symptomatology in females undergoing elective cesarean section under spinal anesthesia using 25G and 27G Quincke needles. These two size needles are commonly used in our institution.

Aims and objectives

The Aim of the Study is to compare the post-dural puncture headache with 25G And 27G Quincke Needle – in terms of Incidence, severity in patients after spinal anesthesia for elective caesarean section and to find out number of attempts for successful block and any associated complications.

MATERIALS AND METHODS

The trial was approved by the Institution Ethics Committee and informed consent was obtained from all participants. It was a prospective observer blind study in females posted for elective cesarean section who were between 20 and 35 years of age, 40–90 kg of weight, and with ASA grade I or II. Those with any cardiac, respiratory or renal disease or having history of headache, and backache or neurological disease were excluded from the study.

Participants were sequentially enrolled into Group A (25 G Quincke needle) or Group B (27G Quincke needle) according to a predefined scheme, in which first two participants were allocated to Group A and the next participant to Group B followed by reversal of the group allocation. This process continued until 300 participants per group was reached. Participants who had failure of subarachnoid block or patchy block leading to general anesthesia were excluded from the study and replaced.

After maintaining standard 8 h fasting guidelines, participants received 2.5 ml bupivacaine heavy after preloading with 15 ml/kg Ringer's lactate solution. Loss of cold sensation at T4 was considered anesthesia. Crystalloid infusion and incremental doses of ephedrine were used to treat hypotension. Postoperatively, hydration was maintained to have an urine output of 1 ml/kg/min.

The participants were evaluated by a blinded observer who was unaware of treatment allocation. For 5 consecutive days, onset of headache, characteristics, duration, severity, and any associated symptoms were assessed. PDPH was defined as postural headache that was aggravated by sitting or standing position and relieved by lying supine. Participants with PDPH were treated with intravenous fluids, bed rest, oral paracetamol 15 mg/kg, and caffeine as per standard institutional practice. Severity of headache was assessed as follows.[6]

Mild

Slight restrictions of physical activity but not restricted to bed and no associated symptoms.

Moderate

Forced to stay in bed for part of the day and restricted physical activity, which was not necessarily associated with symptoms.

Severe PDPH-bed ridden for most part of the day and was always associated with symptoms.

Statistical analysis

No formal sample size was estimated in the absence of precise incidence data or any plan for hypothesis testing. A sample size of 300/group was selected empirically to allow detection 1% incidence. The data were analyzed using Epi Info (Version 7, CDC, USA) and Microsoft Excel 2016 and are presented using descriptive statistics.

RESULTS

The participants were enrolled between October 2019 and December 2020. The two groups were comparable for demography (Table 1). Spinal anesthesia was successful in the first attempt in most participants and only 3.7% in the 25G group and 6% in the 27G group required a second attempt.

PDPH incidence was 11% in the 25G group and 6.33% in the 27G group (Risk Ratio of 0.58 [95% CI: 0.34, 0.99]) (Table 2). Across both the groups, PDPH onset was on the 2nd day and subsided by the 3rd day. In none of the groups, intensity was severe, while all were mild in the 27G group. Nausea and vomiting were the only associated symptomatology, 7.33% in the 25G group and 5.67% in the 27G group.

DISCUSSION

PDPH, a well-known consequence of spinal anesthesia, contributes to increased morbidity, an extended hospital stay, increased costs, and patient dissatisfaction.[7] The signs and symptoms are a result of the iatrogenic hole formed in the dura and arachnoid, which causes cerebrospinal fluid (CSF) leaking, traction on the cranial contents, and meninges and eventually cerebral vasodilation.[8] Further, decreased CSF pressure activates adenosine, resulting in arterial and venous vasodilation.[9] The incidence of PDPH is believed to be influenced by age, gender, pregnancy, hydration, and the type and size of spinal needle.[10] Among these factors, the needle gauze and tip design are important modifiable factors.[11]

Table 1: Demographic and baseline characteristics

Demographic data	Group A (25G) n=300	Group B (27G) n=300
Age in years (Mean±SD)	23.6±2.9	23.1±2.7
Height in cm (Mean±SD)	152.1±2.2	152.7±2.5
Weight in Kg (Mean±SD)	52.9±5.9	53.8±5.2
Gestational age (weeks) (Mean±SD)	38.80±0.76	38.38±0.78
Number of attempts of dural puncture (%)	11 (3.7%)	18 (6.0%)

Table 2: PDPH profile across the two groups

PDPH profile	Group A (25G) n=300	Group B (27G) n=300
Incidence (%)	33 (11.0) 95% CI (7.82, 14.93)	19 (6.33) 95% CI (3.97, 9.54)
	Risk ratio 0.58 (95% CI: 0.34, 0.99)	
Onset of PDPH (%)		
Day 1	0	0
Day 2	19 (6.33)	12 (4.0)
Day 3	14 (4.67)	7 (2.33)
Severity (%)		
Mild	22 (7.33)	19 (6.33)
Moderate	11 (3.67)	0
Severe	0	0
Accompanying symptoms (%)		
Nausea and vomiting	22 (7.33)	17 (5.67)
Neck stiffness	0	0
Tinnitus	0	0
Diplopia	0	0

PDPH: Post dural puncture headache

Overall, a small proportion of participants developed PDPH in either needle size group in our study. The outcome was favorable with the 27G needle in comparison to 25G needle, both in terms of incidence and severity of PDPH. These results in the present study were in line with the literature suggesting lower incidence with finer needle, although the reported incidence varies from one study to other.[11-15] None of the participants developed severe headache in our study likely due to the finer needle use, proper hydration, and immediate treatment.

Turnbull and Shepherd[13] in a review paper published in 2003 observed significant decrease in incidence of PDPH over time from 66% in 1898 to 11% in 1956 with the introduction of 22G and 24G needles. They noted PDPH incidence in literature as 3–25% with 25G, 1.5–5.6% with 27G, and <2% with 29G Quincke needles. In another study published in 2021, Baral PP et al.,[14] reported PDPH incidence of 20% with 25G Quincke, 12.5% with 27G Quincke, and 4.5% with 27G Whitacre needles in Indian females undergoing cesarean section.

In a more recent study, Mohammed and El Shal[15] demonstrated that incidence of PDPH in elective cesarean section could be brought down to 0% using a 29G Quincke needle. However, they observed 29G needle uses to be more time consuming than 22G or 25G needle use to give spinal anesthesia. In addition, the 29G needle also required highest number of multiple trials indicating technical difficulties. Likewise, Turnbull and Shepherd[13] have noted in their review reports of technical difficulties and high failure rate with 29G or smaller needles. They suggested 25G to 27G needle sizes perhaps strike the optimum balance between the risks of dural puncture headache and technical failure.

Strength of the study

The strengths of this study are the large sample size as well as the real life clinical practice setting in a high volume teaching hospital involving many anesthetists of different level of experience.

Limitations of the study

One limitation of the study is non-evaluation of a needle size above 27G.

CONCLUSION

The results of our study support use of 27G Quincke needle to administer spinal anesthesia in females undergoing elective cesarean section.

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Authors' Contributions:
DB, SRN- Principal investigator and research persons who have conceived and designed the study, conducted research, provided research materials, collected the data; **JM-** Organized the data, done the statistical analysis and interpreted it; **BPS, SJ-** Drafted the initial and final manuscript. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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