International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

Incidence of Post Dural Puncture Headache (PDPH) Following Subarachnoid Block With 25g & 27g Quincke Spinal Needles in Non-Pregnant Women Posted for Lower Abdominal Surgery-A Comparative Study

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Received: 16-02-2026
Accepted: 12-03-2026
Available online: 25-03-2026

ABSTRACT

Aim: To find suitable size (gauge) Quincke spinal needle to reduce the risk of PDPH (Post Dural Puncture Headache) in non-pregnant women posted for lower abdominal surgeries.

Method: This was a Randomized, single-blinded, non-placebo-controlled trial at Department of Anesthesia & Intensive Care, for the period of 24 months. However, this study was restricted only to non-pregnant women for lower abdominal surgeries. Total number of patients seen at our Institute during the study period was130 with 65 patients in each group.

Results: This study includes 130 healthy individuals of ASA grade I & II. In this study, study population is divided into 2 groups: Group A: Study population received spinal anaesthesia through 25G Quincke spinal needle. Group B: Study population received spinal anaesthesia through 27G Quincke spinal needle. The observations were compiled and results were analyzed statistically. In this randomized controlled trial ,27G Quincke spinal needle was found to be better in terms of causing less frequency of PDPH, hypotension, nausea and vomiting whereas incidence of bradycardia is slightly more. Thus,27G Quincke spinal needle should be preferred over 25G Quincke spinal needle to reduce frequency of PDPH and maintain stable hemodynamic parameters for a favorable outcome.

Conclusion: PDPH is a well-known complication following spinal anaesthesia since its first case report. The two principal determinant of PDPH are the type and the size of spinal needles. It can be concluded from our study, large bore cutting type of spinal needle (25G Quincke), produces more PDPH than small bore cutting type of spinal needle(27G). Therefore, we recommend routine use of small size Quincke needle(27G) while performing spinal anaesthesia in non-pregnant female patients between 25-50 years of age group posted for lower abdominal surgeries.

Keywords: *Post Dural Puncture Headache (PDPH), Quincke spinal needle Needle gauge (25G vs 27G), Spinal anaesthesia, Lower abdominal surgery (non-pregnant women).*

INTRODUCTION

Spinal anaesthesia (Subarachnoid anaesthesia SAB) was first introduced by *Augustus Karl Gustav* Bier, a German surgeon who used 3ml of 0.5% cocaine intrathecally on six patients for lower extremity surgery in 1898 [1,2]. Thereafter, fears of neurologic deficits and complications caused anaesthesiologists to use less of spinal anaesthesia. The development of novel intravenous anaesthetic agents and neuromuscular blockers coincided with the decreased use of spinal anaesthesia. In 1954,

Dripps and Vandam described the safety of spinal anaesthetics in more than 10,000 patients and spinal anaesthesia was again ***revived***[3]. Spinal anaesthesia is most commonly used regional anaesthesia technique today.

Post dual puncture headache (PDPH) was first described by Augustus Bier in 1898[4] from his personal experience following a failed attempt of spinal anesthesia on himself due to mechanical difficulty. However, his Assistant Hildebrandt[4] was successful in this regard in the same year and he also experienced PDPH.

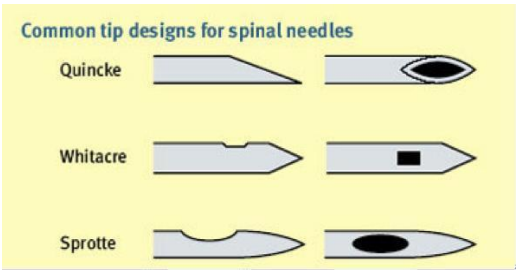
Two most important predictors of (PDPH) are type of spinal needle and its size[5,6]. In 1951 Hart and Whitacre[7] reported lower PDPH rates with pencil point needle (Whitacre) than cutting (Quincke) type of needle.

Till date, numerous studies demonstrated lower incidence of PDPH following spinal anaesthesia with the use of smaller size spinal needle in comparison to larger one.

MATERIALS AND METHOD:

1.Spinal Needles

Spinal needles are commercially available in an array of sizes, lengths, and bevel and tip designs. All should have a tightly fitting removable stylet that completely occludes the lumen to avoid tracking epithelial cells into the subarachnoid space. Broadly, they can be divided into either sharp (cutting) tipped or blunt- tipped needles. The Quincke needle is a cutting needle with end injection. The introduction of blunt tip (pencil-point) needles has markedly decreased the incidence of post dural puncture headache. The Whitacre and other pencil-point needles have rounded points and side injection. The Sprotte is a side- injection needle with a long opening. It has the advantage of more vigorous CSF flow compared with similar gauge needles. However, this can lead to a failed block if the distal part of the opening is subarachnoid (with free flow CSF), the proximal part is not past the dura, and the full dose of medication is not delivered. In general, the smaller the gauge needle, the lower the incidence of headache.



The most important characteristics of a spinal needle are the shape of the tip and the needle diameter. Needle tip shapes fall into two main categories: those that cut the dura and those with a conical, pencil-point tip. The former includes the Pitkin and the Quincke- Babcock needle, and the Whitacre and Sprotte needles belong to the latter group. The orifice of the Whitacre needle is smaller. If a continuous spinal technique is chosen, use of a Tuohy or other thin-walled needle can facilitate passage of the catheter. The use of small needles reduces the incidence of post–dural puncture headache from 40% with a 22-G needle to less than 2% with a 29-G needle. The use of larger needles, however, improves the tactile sense of needle placement, and so although 29-G needles result in a very low rate of post–dural puncture headache, the failure rate is increased. Pencil-point needles provide better tactile sensation of the different layers encountered during needle insertion but, more importantly, they reduce the incidence of post–dural puncture headache. Pencil-point needles of 25, 26, and 27 G probably represent the optimal needle choice. An introducer needle can assist with guidance of smaller- gauge spinal needles in particular.

2.local anaesthetic for spinal use

0.5% Hyperbaric Bupivacaine: The solution is commercially available as 0.5% Bupivacaine heavy by adding dextrose.

METHODS

After obtaining ethical committee clearance and written consent from adult women this randomized controlled trial was performed at Nalanda Medical College & Hospital, on patient undergoing lower abdominal surgery.

A) Type of study: Randomized, single-blind, non- placebo-controlled study on similar study cohorts of adult women undergoing lower abdomen surgery

B) Study area: Department of Anaesthesiology, Dept. of Obstetrics & Gynaecology, NMCH Patna

C) Study population: 130 consenting women between 25-50 years of age with ASA l and ASA II were undergone lower abdominal surgery during the data collection period.

D) Study period: March 2025 – February 2026

E) Sample size: The number of patients required in each group was calculated on the basis of incidence of PDPH as the primary assessments measure. It was estimated that at least 65 subjects will be required per group in order to detect a

difference of 20% incidence with 80% power and 5% probability of Type 1 Error. This calculation assumes incidence with control arm to be 30%- and-two-sided testing. We have taken 65 patients in each study group to rule out any drop out during the study period and also to enhance the power of the study i.e., 130 patients overall.

F) Sample design: In this single blind randomized study, patients were allocated into two study groups by computer generated randomization, according to the following inclusion and exclusion criteria:

Inclusion Criteria –

1. Non pregnant Female patients scheduled for elective lower abdominal surgery.
2. Patients with physical status ASA I and II
3. Age between 25-50 years

Exclusion Criteria –

1. Patient's refusal
2. Allergic amide local anaesthetics.
3. History of drug and alcohol abuse.
4. Patients in whom spinal anaesthesia is contraindicated.
5. Inadequate block (sensory block <T8 segment).
6. Body mass index > 30 kg/m^2.
7. Patients with severe systematic disorders like Stage -2 Hypertension, Diabetes, Musculoskeletal, Neurological diseases etc.
8. Presence of Endometriosis, Adhesion, Tumors / carcinomas and other pathological causes.
9. Pre-existing headaches like Cluster headache, migraine, Sinusitis, etc.
10. Subarachnoid block > one attempt.

G) Study Design:

This randomized, single-blind trial was performed on female patients from Department of Gynecology & Obstetrics, Nalanda Medical College & Hospital posted for lower abdominal surgery.

H) Parameters to be Studied:

1. Onset and duration of PDPH
2. Frequency and severity of PDPH
3. Other/ untoward complications if any.

I) Study tools:

1. Spinal needles (25G & 27G Quincke needles)
2. Standard monitorings
3. Spinal drug (3.5ml Bupivacaine heavy)
4. Drug for premedication (2mg of Midazolam, 4mg Ondansetron, Tab Ranitidine 150 mg)
4. I.V.Fluids
5. Other Drugs; Vasopressor, Atropine etc.

J) Study Techniques:

Equal number of patients (n=65) were allocated into two groups (i.e., 25G & 27G) based on Computer generated Random Number Method. Patients & Surgeons were unaware of the size of spinal needles to be used. All patients received tab Clonazepam 0.5 mg on the night prior to the day of surgery. They also received tab Pantaprazole 40 mg once at the previous night and another in the morning of the day of surgery. Before being taken to the operation theatre, they were preloaded with 500 ml Ringer Lactate solution via 18G cannula and Inj Ondansetron 4mg was given intravenously. In the OT, Spinal anaesthesia was given in the sitting position through 25G and 27G Quincke needles in Group A and Group B patients respectively. About 3.5ml 0.5% Bupivacaine heavy was injected at either L_2-L_3 or L_3-L_4 interspace in both groups. After verifying effective Spinal block (sensory and motor), 2mg Midazolam iv was given to alleviate anxiety. Then surgery was allowed to start. Supplemental O_2 was given at 4L/min via face mask. At the end of the operation, a decrease of at least two segments regression of maximal sensory block was sought; if not present we checked the parameters every 10 mins interval by Pin prick method. After achieving aforesaid criteria along with cardiovascular stability patients were allowed to shift to the ward. In the post-operative period the **frequency and severity** of PDPH were noted up to the 5^{th} post operative day. Other complications (if any) were also noted. Post operative analgesia was provided with inj Diclofenac (water soluble) 75mg i.m. 12 hourly[107] along with Inj. Tramadol 100 mg i.m. 8 hourly[108] for first 48 hours. After then oral NSAID was given along with oral H_2 blocker. Occurrence of PDPH was treated by bed rest, enhancement of fluid intake, analgesics, caffeine and avoidance of straining. In refractory, PDPH, treatment protocol was epidural blood patch.

Any hypotension was identified as mean arterial pressure lower than 25% of baseline and treated by Ephedrine 6 mg

incremental doses. Bradycardia was identified when heart rate fallen less than 50/min and was treated by atropine 0.6 mg incremental dose.

A decrease in SpO2 to < 90% was defined as hypoxia and was treated with incremental flow of supplemental oxygen via a Hudson type polymask.

RESULTS:

Of the 130 patients chosen for this study,65 patients were administered spinal anaesthesia through 25G Quincke spinal needles (Group A) & the remaining 65 patients also received spinal anaesthesia through 27G Quincke needle (Group B).

Group A (using 25G Quincke needle)

Age group	No.	Percent (%)
≤ 30	5	7.69%
31-40	29	44.62%
41-50	31	47.69%
Total	65	100%

Table-1 Age-wise distribution of cases under

The given table shows the percentage of cases from 25-50 years of age group under study. Patients were divided into three groups according to their age range i.e A)> 30 years B)31-40 years C)41-50 years

Surgery	No.	%
myomectomy	5	7.69
TAH	14	21.54
TAH,ovarian cystectomy	2	3.08
TAH+BSO	41	63.07
Laparotomy	3	4.62
Total	65	100.00

Table-2 Surgery wise frequency of patients under study

The given table demonstrated percentage of cases under study according to surgery performed

Age (Years)	ASA-PS	Surgery	Severity	Onset (Days)	Duration (Days)
36	I	TAH	Mild	2nd	D2-D3
48	II	TAH+BSO	Mild	1st	D1-D2
46	II	TAH+BSO	Moderate	1st	D1-D3
36	II	TAH	Moderate	2nd	D2-D4
27	I	Myomectomy	Mild	2nd	D2-D3

Table-3. Profile of cases with Post-Dural Puncture Headache (PDPH) under study.

The given table demonstrated profile of the patients who developed post-dural puncture headache (PDPH) following spinal anaesthesia. The frequency, onset, duration and severity of PDPH were also documented.

Age	ASA-PS	Surgery	PDPH Incidence	Nausea/vomiting	Bradycardia
50	II	TAH+BSO	Absent	Present	Absent
35	I	TAH	Absent	Present	Absent
36	I	Ovarian cystectomy	Absent	Present	Absent
36	I	laprotomy	Absent	Present	Absent
36	I	TAH	Absent	Present	Absent
36	I	TAH	Absent	Present	Absent
48	II	TAH+BSO	Absent	Present	Absent
48	II	TAH+BSO	Absent	Present	Absent
40	II	TAH+BSO	Absent	Present	Absent
40	I	TAH+BSO	Absent	Present	Absent
42	II	TAH+BSO	Absent	Present	Present
45	II	TAH+BSO	Absent	Present	Absent
25	I	Myomectomy	Absent	Present	Absent

Table-4. Profile of cases developed nausea/vomiting and bradycardia following Spinal anaesthesia.

Age	ASA-PS	Surgery	PDPH	Hypotension
50	II	TAH+BSO	Absent	Present
36	I	TAH	Absent	Present
42	II	TAH+BSO	Absent	Present
38	II	TAH	Absent	Absent

Table-5. Profile of cases developed hypotension following spinal anaesthesia

Group B (using 27G Quincke needle)

Age Group	No.	%
<=30	3	4.62
31-40	31	47.69
41-50	31	47.69
Total	65	100.00

Table-1. Age-wise distribution of cases under study.

The given table shows percentage of cases from 25-50 years of age under study. Patients were divided into three groups according to their age range i.e.A<30 years B)31-40 years C)41-50 years.

Surgery	No.	%
Myomectomy	4	6.15
Recanalization	1	1.54
Rt .salphingooophorectomy	1	1.54
TAH	7	10.77
TAH+Ovarian cystectomy	1	1.54
TAH+BSO	51	78.46
Total	65	100.00

Table-2. Surgery-wise frequency of patients under study:

Case no.	Age (Years)	ASA-PS	Surgery	Severity	Onset	Duration
1.	46	II	TAH+BSO	Mild	D2	D2-D3
2.	43	II	TAH+BSO	Moderate	D1	D1-D3

Table-3. Profile of cases with Post-dural puncture headache (PDPH) under study.

The above table demonstrated profile of the patients who developed post-dural puncture headache (PDPH)following spinal anaesthesia. The frequency, onset, duration and severity of PDPH were documented

Age (Years)	ASA-PS	Surgery	PDPH	Nausea/vomiting	Bradycardia
35	I	TAH	Absent	Present	Absent
42	I	TAH	Absent	Present	Present
36	I	TAH	Absent	Present	Absent
46	II	TAH+BSO	Absent	Present	Absent
39	I	TAH	Absent	Present	Absent
40	II	TAH+BSO	Absent	Present	Absent
50	II	TAH+BSO	Absent	Present	Present
42	II	TAH+BSO	Absent	Present	Absent
45	II	TAH+BSO	Absent	Present	Absent
50	II	TAH+BSO	Absent	Present	Absent

Table-4. Profile of cases developed nausea/vomiting,bradycardia following spinal anaesthesia.

Age(Years)	ASA-PS	Surgery	PDPH	Hypotension
36	I	TAH	Absent	Present
40	II	TAH+BSO	Absent	Absent
35	I	Rt.Salphingo-oophorectomy	Absent	Absent

Table-5. Profile of cases who developed hypotension following spinal anaesthesia.

COMPARISON OF TWO GROUPS

Quincke Spinal needles	25G(Group A)	27G(Group B)
Mean (Age)	40.35	41.4
Range	25-50 Years	25-50 Years

Table-1. Statistical difference between two groups.

Age group	25G (Group B)		27G(Group B)	
	No.	%	No.	%
<=30 Years	5	7.69	3	4.62
31-40 Years	29	44.62	31	47.69
41-50 Years	31	47.69	31	47.69
Total	65	100.00	65	100.00

Table-2. Comparison of Age groups

Surgery	25G (Group A)		27G (Group B)	
	No.	%	No.	%
Myomectomy	05	7.69	04	6.15
Recanalization	-	-	01	1.54
Rt.salphingo-oophorectomy	-	-	01	1.54
TAH	14	21.54	07	10.77
TAH Ovarian cystectomy	02	3.08	01	1.54
TAH+BSO	41	63.07	51	78.46
Laparotomy	03	4.62	-	-
Total	65	100.00	65	100.00

Table-3. Surgery wise frequency of patients under study.

Spinal Needles	PDPH		Hypotension		Bradycardia		Nausea/vomiting	
	No.	%	No.	%	No.	%	No.	%
25G Quincke (Group A)	5	7.7	3	4.61	1	1.54	13	20
27G Quincke (Group B)	2	3.08	1	1.54	2	3.08	10	15.38

Table-4. Comparison of complications between two groups (65 patients in each group)

According to the statistician, calculation of p value is not required as the range of complications are wide in some cases and very narrow in other cases between two groups.

DISCUSSION

The prospective observational cohort study was done to compare the incidence of PDPH following spinal anaesthesia through 25G and 27G Quincke spinal needles in non-obstetric cases posted for infra umbilical surgeries during the period of May 2025 to April 2027 at Nalanda Medical College & Hospital.

A total of 130 non-obstetric patients between 25-50 years of age group belonging to ASA-PS I&II were selected into two groups i.e Group A(25G Quincke spinal needle) and Group B(27G Quincke spinal needle).

Spinal anaesthesia was administered in sitting position at L2-L3 or L3-L4 interspace through either 25G or 27G Quincke spinal needles. About 3.5 ml Bupivacaine[8] heavy was injected intrathecally.

Incidence, onset, duration and severity of PDPH were noted as primary assessment following spinal anaesthesia up to 5 days. Any untoward events like Bradycardia, Hypotension and Nausea/vomiting were also noted as secondary assessment. The demographic data with respect to age, body weight, height and BMI were comparable among the two groups with no statistical difference ($p>0.05$). Hemodynamic variables like pulse rate and blood pressure were similar among the groups starting from baseline values till completion of operation.

We choose adult women aged between 25-50 years undergoing lower abdominal surgeries only to exclude maximum biases due to selection of patients and surgeries and to confirm uniformity. The types of surgical cases performed were also similar, with similar times for anaesthesia and surgery in both the groups.

Regarding hemodynamics, the systolic blood pressure and diastolic blood pressure were maintained without any significant difference among the patients in both groups throughout the procedure. A decrease was found in the mean systolic blood pressure in the first 30 minute of anaesthesia in both groups.

Degree of hypotension was comparable with no significant difference throughout the procedure between two groups. Drug requirement of phenylephrine for management of hypotension was comparable between two groups with no significant difference.

Incidence of bradycardia was comparable between two groups with no significant difference throughout the procedure ($p>0.05$). Requirement of atropine for management of bradycardia was comparable with no significant difference throughout the procedure between both groups($p>0.05$).

In our study, there were no serious adverse effects in any of the patients between the two groups who received Bupivacaine heavy. This was similar to findings by all the studies done previously with this preparation. All drugs and needles were supplied free of cost by Government of Bihar.

Infraumbilical surgeries performed under spinal anaesthesia are less hazardous than general anaesthesia. Nowadays, it is a common and acceptable anaesthetic practice throughout the world. Headache after dural puncture is a complication of spinal anaesthesia and is believed to result from leakage of CSF both at the time of dural puncture and probably more important due to continuous leak afterwards[9.] Post dural puncture headache is a complication that should not be treated lightly. There is potential considerable morbidity due to post dural puncture headache and there are reports of PDPH symptoms lasting for months or years[10.] Untreated PDPH may lead to subdural haematoma[11] and even death may occur following bilateral subdural haematoma[12]. Therefore, anaesthesiologists are advised to prevent PDPH by optimizing the controllable factors like spinal needles size as well as shape while conducting spinal anaesthesia[13].Obstetric patients are at high risk of PDPH than non-obstetric females under 40 years of age[14].

Diagnosis of post dural puncture headache depends upon the body position; the pain is aggravated by sitting or standing and relieved or decreased by lying down flat[15].

Apart from other factors, post dural puncture headache is related to the size as well as the types of spinal needle used[16,17]. It is progressively reduced with the use of smaller size spinal needles[17,18,19].Pencil tip needles produce less damage to the dural fibers and allow the hole to close more readily. Thus, they have a lower incidence of post dural puncture headache than cutting needle tip designs[20].

The overall incidence of post dural puncture headache ranges from 0% to 37% as reported by various authors[21]. Reported frequency of PDPH ranges from 4%[22] to 40%[23] with Quincke spinal needle used in young females. Ross et al[24] reported in 9% of patients.In the study by Roheenea and colleagues[24] ,severity of PDPH was from mild to moderate. None of the patients complained of severe PDPH. It was more on 1stpost operative day and gradually decreased on the subsequent days. Incidence of PDPH with 27G Quincke needle ranges from 1.1%[24] to 12.8%[25]. However, in a recent study by Muhammad et al[26], frequency of PDPH was 0% with 27G Quincke spinal needles when spinal anaesthesia was administered for caesarean section.

In a study by Viitanen et al[27], PDPH incidence was 8.5%. It was mild in 4%, moderate in 3% and severe in 1% of patients. Symptoms started on first or second day after spinal injection and lasted for 3 days.

In our randomized study, the frequency of PDPH was 7.7% with 25G Quincke needle and 3.08% with 27G Quincke needle. There was no severe PDPH in either of the groups of our study therefore, clearly demonstrated a significant reduction in frequency of PDPH when smaller size Quincke needle was used as compare to larger ones. In a study by Landau et al[28], incidence of PDPH with 27G Whitacre needle was less than 1%. However, a study by shah and colleagues[29] which closely resembles our study, demonstrated PDPH incidence was 20% with 25G Quincke needle and 12.5% with 27G Quincke

needle and 12.5% with 27G Quincke needle, a relatively higher frequency of PDPH in both groups.

Grading of PDPH severity[30]

Mild	No limitation of activity
	No treatment required
Moderate	Limitated activity
	Regular analgesics required
Severe	Confined to bed
	Anorexic

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