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PREVALENCE OF POST-DURAL PUNCTURE HEADACHE AMONG PATIENTS WHO UNDERWENT ELECTIVE GENERAL SURGERY: A PROSPECTIVE CROSS-SECTIONAL STUDY

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ABSTRACT

Objective: To evaluate the prevalence and risk factors of post-dural puncture headache (PDPH) among who underwent elective general surgery.

Background: PDPH is a common complication after LP. The incidence of PDPH following subarachnoid block varies between ranges from 0.3% to 40% and is influenced by characteristics like age, gender, needle size and type of needle, multiple attempts of the subarachnoid block and spinal anesthesia injection at the sitting position.

Methods: This is a cross-sectional study performed at the National Institute of Unani medicine over the period from January 2022 - October 2022 where 147 patients enrolled for the study by calculation from the sample size estimation.

Results: 147 LPs performed over 10 months headache developed in 6 (4.08%; 95% CI). 95 percent of cases with PDPH resolved on their own or with minimal conservative intervention. Greater headache risk was associated with female gender (P-0.018655), younger age (P-0.000042) and 25G Quincke spinal needle(P-0.011797).

Conclusion: Lumbar punctures frequently result in headaches. The use of a thin, atraumatic needle is strongly advised in order to decrease the incidence. When performing spinal anesthesia for general surgery, the 26G Quincke spinal needle has a definite advantage over the 25G Quincke. Therefore, we advise routine use of the 26G Quincke spinal needle while administering spinal anesthesia. Post-Dural headaches following a spinal puncture are more likely to occur in those with low body mass index, repeated spinal injection attempts, under 40 years of age, more than two CSF drops out, a history of chronic headache and migraine, and female gender.

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Keywords: PDPH, Subarachnoid bock, Quincke spinal needle.

INTRODUCTION

According to the International Headache Society, the criteria for PDPH, include a headache that starts less than 7 days after a spinal puncture. It worsens after 15 minutes of standing or sitting and improves after 15 minutes of lying down. The headache should disappear within 14 days after a spinal puncture, if it persists it is called a CSF fistula headache[1] The post-dural puncture headache (PDPH) is the most common complication after a neuraxial anesthesia[2]. According to the International Classification of Headache Disorders criteria, PDPH is a headache that develops

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within 5 days after dural puncture becomes worse while in an upright position and gets better with lying down and is accompanied by neck stiffness, tinnitus, photophobia, and nausea.[3].

The incidence of PDPH was 66% in 1898, which was probably the use of large gauge, medium bevel, and cutting spinal needles. In 1956, with the introduction of 22-gauge and 24-gauge needles, the incidence was predicted to be 11%. The advent of modern needles like Sprotte and Whitacre has further reduced the incidence of PDPH2. The incidence of PDPH following subarachnoid space varies between ranges from 0.3% to 40% and is influenced by characteristics like age, gender, needle size and type of needle, multiple attempts of the subarachnoid block, spinal anesthesia injection at the sitting position, previous PDPH Spinal needles generally used today are 22 to 27 G, but sizes ranging from 19 to 30 G are available[4,6]

Size of needle (Quincke cutting spinal needle)	**The incidence rate of PDPH (according to Weji et. al)**[6,11]
22G	36%
25G	25%
26G	2-12%
Less than 26 G	less than 2%

The well-known risk factors of PDPH include (a history of PDPH or chronic headache), lower BMI, non-smoker, stress, tall height, lower SBP young age, female sex, and pregnancy. Compared to elder people, young adults have a higher risk of acquiring PDPH (14% vs. 7%). because the dura may become less elastic and less likely to gap with advancing age. Women are found to be at a higher risk for PDPH, particularly during pregnancy. Increased estrogen levels may contribute to its high occurrence by altering the tone of the cerebral arteries and causing an increase in vascular distension in response to CSF hypotension[5]. Modifiable risk factors of PDPH included the needle size, needle shape, bevel orientation and inserting angle, stylet replacement, and operator experience[6]. As for the tip design, the cutting-point (Quincke needles were easier to insert through the skin and ligaments, while the pencil-point needles were easier to recognize the dura mater.[7]

The first spinal anesthetic was delivered by an accident. In 1891, Wynter and Quincke aspirated cerebrospinal fluid (CSF) from the subarachnoid space for the treatment of raised intracranial hypertension associated with tuberculous meningitis. The catheters and trocars used were probably about 1 mm in diameter and would certainly have led to a post-dural puncture headache8. Karl August Bier, a German surgeon, injected cocaine 10-15 mg into the subarachnoid space of seven patients. Bier and Hildebrandt and four of the subjects all described the symptoms associated with postural puncture headaches. Bier surmised that the headache was attributable to loss of CSF. The first incidence of post-dural puncture headache (PDPH) was reported by August Bier in [1898.9,10,16].

CSF production occurs mostly in the choroid plexus, but there is some evidence of extra choroidal production. About 500 ml of CSF is produced daily (0.35 ml min). The CSF volume in the adult is approximately 150 ml, of which half is within the cranial cavity. The CSF pressure in the lumbar region in the horizontal position is between 5 and 15 cm H2O. On assuming the erect posture, this increases to over 40 cm H2O. There are two possibilities for mechanism PDPH First, the lowering of CSF pressure causes traction on the intracranial structures in the upright position. traction on the blood vessels, basal dura, tentorium and other pain-sensitive intracranial structures leading to the characteristic headache.[10,17] Pressure on the upper cervical nerves including C1, C2, and C3, causes pain in the neck and shoulders. A frontal headache is the result of fifth cranial nerve compression. Pressure on the sixth cranial nerve causes visual symptoms. The Pain in the occipital region is due to the pressure on the ninth and tenth cranial nerves Secondly, the loss of CSF produces a compensatory vasodilatation via the Monro-Kellie hypothesis with a sudden drop in CSF pressure, vasodilation of the intracranial vessels occurs to maintain a constant intracranial volume, resulting in a pathogenesis similar to a vascular.

headache. This mechanism is supported by the therapeutic effect of vasoconstrictor drugs like caffeine and theophylline in PDPH[11,12,18,19]. Complete rest in a supine or prone position, as well as fluid therapy, are examples of supportive treatment. In contrast to existing non-invasive therapies for PDPH, effective non-invasive therapies such as analgesics (acetaminophen, codeine, nonsteroidal anti- inflammatory drugs, narcotics), caffeine, theophylline, sumatriptan (5HT agonists), and adrenocortical hormone. Pregabalin has been used to treat a variety of conditions including epilepsy and chronic pain[13]. dexamethasone may exhibit its analgesic property by inhibiting the generation of pain-producing mediators (such as prostaglandin I_2 and E2).[14] In the invasive treatment of PDPH Epidural blood patch (EBP), epidural fluid and epidural morphine[15].

PDPH is classified into mild, moderate and severe forms: Mild is slight and does not restrict daily activities. The patient is not bedridden at any time during the day. There are no other associated symptoms like nausea, vomiting[16], etc., moderate is significant and restricts daily activities. The patient is bedridden for some part of the day. Associated symptoms may or may not be present[16], and severe Here PDPH is very intense and forced the patient to stay in bed throughout the whole day. Associated symptoms are always present. In one study, it is found that 86% of patients who developed PDPH have associated symptoms such as nausea (60%), vomiting (24%), stiffness of the neck (43%), ocular (13%) and auditive symptoms (12%)[16,17].

MATERIALS AND METHODS

Study site: This is a cross-sectional study performed at the National Institute of Unani medicine over the period from January 2022- October 2022 where 147 patients enrolled for the study by calculation from the sample size estimation. It is an autonomous institute working for research, teaching and training situated in north Bangalore. It is also a training center for postgraduate students in general surgery.

Study design: This was a prospective cross-sectional study.

Sample size calculation: The sample size and 10% attrition for this study was derived to be 147 patients using the formula by which stated: N=Z21-α/2 P(1-P) /d2 (where N = the desired sample size for each group Z=standard normal deviation set at 1.96, (which corresponds to a 95% confidence interval),

P=Prevalence study of PDPH from previous study 0.3% to 40%[2]

Inclusion criteria: All participants who underwent elective general surgery under spinal anesthesia that were willing to participate in the trial and gave informed consent are included in the study. Having low BMI, female patients, multiple attempts of spinal injection, loss of CSF drop of more than two, history of migraine and sinusitis, and spinal injection with a needle size of less than or equal to 22 gauge were positively associated with the PDPH.

Exclusion criteria: Difficult LP (apply needle > 3 times), repeated LP within 1 month, pregnancy or lactation, history of chronic headache, severe dementia, very severe headache and non-ambulate or bedridden. Those not willing to participate in the study were also excluded.

Statistical analysis: The chi-square ($\chi 2$) and fisher's exact test were used to analyze the data. Data were entered and coded. Data were double-checked for reliability afterwards entered values were corrected. The statistical software for the social science (SPSS) version 20 was then used for a descriptive analysis of the outcome. Cross-tabulation was used to further analyze data and find statistical correlations between variables. The incidence and severity of PDPH were analyzed.

Table 1: PDPH Patients characteristics.

S. No.	Variables	Frequency	PDPH			
			Yes	No		
1.	Age					
	< 40 years of age	28	5	23	19	0.000042*
	>40 years of age	119	1	118	80	

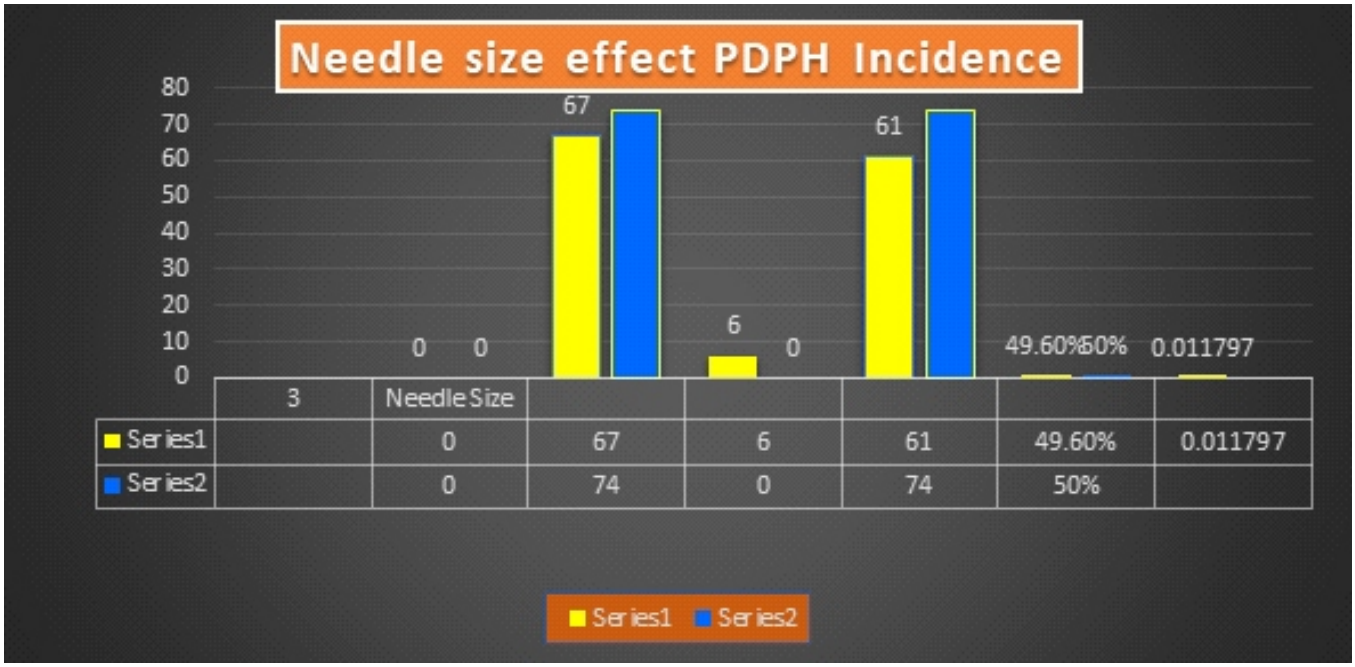
2.	**Gender**					
	Male	69	0	69	46.9	0.018655*
	Female	78	6	72	53	
3.	**Needle Size**					
	25 G	67	6	61	49.6%	0.011797*
	26 G	74	0	74	50%	
4.	**No. of attempts**					
	One	106	2	104	72.1%	0.041028*
	Two	41	4	37	27.8%	
5.	**Number of CSF drops aspirated**					
	Two	112	1	111	76%	0.001144*
	Three or more three	35	5	30	23.8%	
6.	**BMI**					
	Underweight	27	4	23	18.3%	0.025630*
	Normal	107	1	106	72.7%	
	Overweight	13	1	12	8.84%	
7.	**History of migraine/ sinusitis**					
	Yes	32	4	28	21.7%	0.024669*
	No	115	2	113	78.2%	
8.	**History of spinal anesthesia**					
	Yes	41	3	38	27.8%	0.348*
	No	106	3	103	72.1%	

*Chi-Square test and Fishers exact test

Table 2 Showing symptoms of patients.

S. No.	Variables	Frequency	Yes	No	Percentage
1.	**Onset**				
	6h-12hours	2	2	4	33.3%
	12h-72hours	4	4	2	66.6%
2.	Site				
	Occipital	1	1	5	16.6%
	Frontal-	5	5	1	83.3%
3.	Associated symptoms				
	Nausea	1	1	5	16.6%
	Vomiting	2	2	4	33.3%
	Stiffness of neck	3	3	3	50%
	Dizziness	-	-	-	-
	Diplopia	-	-	-	-

4.	**Pain in Position**				
	Sitting	2	2	4	33.3%
	Standing	4	4	2	66.6%
5.	**PDPH Grades**				
	Mild	2	2	4	33.3%
	Moderate	3	3	3	50%
	Severe	1	1	5	16.6%



RESULTS

Data were collected from 147 patients. The incidence of spinal headaches in literature is related to needle size and varies from 0.1% to 36%. Of the 147 tested patients, 6 patients had PDPH. Out of 147 patients < 40 years of age 28 (19%), and > 40 years of age 119 (80%) Patients P-value (0.000042) (Table 1). Out of 147 patients, 69 (46.9%) were males and 78 (53%) were males P-value (0.01865) (Table 1). Out of 147, 67(49.6%) patients underwent subarachnoid block by 25G Quincke spinal needle, and 74(50%) patients with 26 G P-value (0.011797) (Table 1). No. of attempts for the subarachnoid block were one in 106 (72.1%) patients and two in 41(27.8%) patients P-value of 0.041028 (Table 1). Two or equal to two Drops of CSF out of 112 (76%) More than two in 30(23.8%) P-value (0.001144) (Table 1). BMI of 27(18.3%) patients were underweight, 107 (72.7%) were normal weight and 13(8.84%) were overweight P-value (0.025630) and 4 PDPH patients on underweight (Table 1). History of sinusitis/migraine was present in 32 (21.7%) patients and absent in 115(78.2%) patients. The previous history of spinal anesthesia was present in 41(27.8%) and absent in 106 (72.1%) patients. (Table 1). In the less than 42 years of age group 5 patients had PDPH out of 6 with a p-value of 0.000042 and all 6 patients were female with a p-value of 0.018. All 6 patients had PDPH by undergoing a subarachnoid block of 25G Quincke spinal needle with p value 0.0117. Out of 6, 5 patients had 2 or more than 2 attempts with a p-value of 0.025. H/o migraine/sinusitis was present in 4 patients of PDPH with a p-value of 0.024(Table 1). 4 patients had a duration of headache 12h-72h after surgery. The site of PDPH was frontal in 5 patients and pain occurred in standing position in 4 PDPH patients out of 6. (Table 2).

DISCUSSION

According to Chohan et.al Patients aged; 20-40 years are most susceptible whereas the lowest incidence occurs after the fifth decade. The lesser incidence of PDPH in an elderly individual is due to a decrease

inthe elasticity of cranial structures, which occurs in the normal ageing process. In our present study incidence, is more in underweight female patients whose BMI is less than 18.5. Kang et al reported twice the incidence of PDPH in women (13.4%) compared with men 5.7%20. According to Martin et al, A high incidence is also reported low BMI. The incidence of spinal headaches in literature is related to needle size and varies from 0.1% to 36%20. The incidence of headache is lesser with dural fiber splitting needles such as Whitacre needle rather than dura cutting needles such as Quincke needle.20 Hashel et.al PDPH over the age Female gender presented a risk for PDPH 8-times greater than that of males, which was found to be higher than reported numbers in the literature of 60 is rare, Lower BMI in our study was found to be an independent risk factor for PDPH patients with BMI less than 30 kg/m2, the percentage of PDPH was 45%, in comparison to patients with BMI greater than 30 kg/m2 where the incidence was 25%21. In present study shows incidence is higher in underweight females. Needle size is the most important reason for the development of PDPH. The smaller needle diameter had been thought effective to reduce the incidence of PDPH. In the present study all 6 PDPH patients subarachnoid block by 25G Quincke spinal needle. Muhammed Shaikh et.al Reported frequency of PDPH ranges from 4%-24% to 25%-40% when a 25G Quincke spinal needle is used in young females. In the study by Roheena and colleagues, the severity of PDPH was mild to moderate. The present study indicates patients have mild-moderate PDPH. PDPH with a 26-gauge Quincke needle ranges from 1.1% to 12.8%.22 Lybecker et al, did not find a significant association between the number of punctures and the frequency of PSPH after multivariate analysis 23. But a recent study contradicts it indicating a greater number of attempts have more incidence of PDPH.

CONCLUSION

When performing spinal anesthesia for general surgery, the 26G Quincke spinal needle has a definite advantage over the 25G Quincke. Therefore, we recommend routine use of the 26G Quincke spinal needle when performing spinal anesthesia. Having low BMI, multiple attempts of spinal injection, less than 40 years of age, more than two CSF drops out, a previous history of chronic headache and migraine, female gender are likely to have post-Dural headaches after a spinal puncture.

CONTRIBUTION OF AUTHORS

Prof. Saiyad Shah Alam: Conceptualized the study and reviewed the final draft.

Dr Aeliya: Collection of the material and relevant literature and prepared the draft of the article.

Prof. Gulamuddin Sofi: Critical appraisal and correction of the draft.

Competing interests

The authors declare that they have no competing interests.

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