ejpmr, 2025, 12(5), 796-803

SJIF Impact Factor 7.065

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

THE INCIDENCE AND CAUSES OF HEADACHES AFTER SPINAL ANESTHESIA IN CESAREAN SECTIONS

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Article Received on 21/03/2025 **Article Revised on 11/04/2025** **Article Accepted on 01/05/2025**

ABSTRACT

Background: Spinal anesthesia is the most commonly used anesthesia technique for cesarean section with a prevalence rate of 80% - 95%. The most common complications of spinal anesthesia are post-dural puncture headache associated with dural puncture and cerebrospinal fluid leak. **Methods**: A cross-sectional descriptive study was conducted in Damascus Governorate during the period from 1/11/2024 to 5/1/2025. Data from 141 patients were studied through a questionnaire distributed in paper and electronic form, containing a set of questions that serve the research objective. **Results**: Our study included 141 patients who underwent cesarean section under spinal anesthesia. Their ages ranged from 21-58 years, and the most participating age group was "20-30 years" (67.5%). Patients were classified by the American Society of Anesthesiologists (ASA): "ASA1" (95.7%), "ASA2" (4.3%). History of spinal anesthesia (48.9%). Number of attempts with a puncture needle: "once" (39.7%), "twice" (22.7%). Academic level of the person performing the spinal block: "physician" (44.7%), anesthesia technician (55.3%). Symptoms experienced by patients after spinal anesthesia: "nausea/vomiting" (48.3%), "tinnitus" (17.9%), "foveal rigidity" (15.5%), "double vision" (11.1%). **Conclusion**: In our study, the incidence of headache after dural puncture was 3.5%. Studies show that factors such as needle size, number of attempts, body mass index, and anesthesiologist experience are associated with increased incidence of headache. Repeated attempts were observed to increase the likelihood of headache by 1.5 to 4 times. Headache rate was higher when anesthesia was administered by an anesthesia technician than by an anesthesiologist. Our study did not show an association between these factors and headache incidence, which is attributed to the difference in sample sizes studied.

KEYWORDS: Post-dural headache, post-spinal headache, Cesarean section.

BACKGROUND

According to the International Headache Society, post-dural puncture headache (PDPH) is defined as a headache occurring within 5 days of a dural puncture. It is characterized by bilateral, vague pain originating in the frontal region and radiating to the back of the head. It worsens within 15 minutes of sitting/standing, sneezing, coughing, and tension, and improves within 15 minutes of lying down.[1-9] This headache is accompanied by neck stiffness, dizziness, photophobia, tinnitus, and double vision, as well as nausea and vomiting. These symptoms resolve spontaneously within one week or after the leak is sealed with an autogenous epidural patch within 48 hours. However, PDPH is not associated with fever, leukocytosis, and neurological deficits.[1-9]

PDPH is a devastating complication of procedures that puncture the dura mater, such as epidural/spinal anesthesia, accidental dural puncture during spinal surgery, diagnostic lumbar puncture, myelography, and epidural injections.[10-12]

Although PDPH can occur immediately after a dural puncture, 90% occur within 3 days, and 66% of cases will begin within the first 48 hours of the puncture.[13,8]

According to the International Classification of Headache Disorders criteria, 29% of patients experience headache alone without other symptoms. This finding suggests that headache is a key diagnostic criterion for diagnosing PDPH.[6]

Although the exact cause of PDPH remains unknown, the primary cause of PDPH is a cerebrospinal fluid leak, which progresses over a period of minutes to several hours. This is associated with a sudden cerebrospinal fluid leak and decreased cerebrospinal fluid pressure, ultimately leading to gravitational stress on pain-sensitive structures.

In addition, the onset of PDPH secondary to cerebrospinal fluid leak is a result of activation of

adenosine receptors, which subsequently causes dilation of intracranial arteries and veins to compensate for the increase in blood volume through the Monro-Kelly nodule.[16,15,14,11]

Obstetric patients are at risk for PDPH due to their gender, age, and higher exposure to nerve blocks.[17,7,4]

The pain of PDPH is severe and causes discomfort for the patient, which can lead to maternal dissatisfaction with spinal anesthesia, disruption of child care, increased healthcare costs, hospital stays, and emergency department visits, as well as an increased risk of spinal anesthesia refusal later.

AIM OF THE STUDY

Post-spinal anesthesia headache is a common complication that can significantly impact maternal health after cesarean delivery. Given that spinal anesthesia remains the preferred method for cesarean delivery due to its effectiveness and safety, understanding the incidence and causes of associated headaches is crucial. These headaches not only cause discomfort for the patient but can also impede early mother-infant bonding and prolong hospital stay. Our study aims to shed light on the incidence and causes of post-spinal headaches in cesarean deliveries, ultimately leading to improved maternal care and patient satisfaction in obstetric anesthesia.

METHODS: A descriptive, cross-sectional study was conducted in Damascus Governorate from November 1, 2024 to January 5, 2025. Data from 141 patients were collected using a questionnaire distributed electronically and in paper form. The questionnaire contained a set of questions to serve the research purpose. Our study included patients who underwent a cesarean section under spinal anesthesia and subsequently suffered from headaches. We excluded patients with other causes of headaches, such as migraines or a history of headaches. Approval was obtained from the Syrian Private University to distribute the questionnaire.

Statistical analysis

Patient data were tabulated and entered into the computer. The questionnaires prepared by the students were collected and filled out and entered into the Excel program. Then, the Statistical Package for the Social Sciences (SPSS) program, version (26), was used to analyze this data. The following statistical methods were used in the analysis: Descriptive analysis: This consists of finding the relative frequency distributions of the categorical study variables (gender, place of residence, financial status, etc.) and adding graphic forms to enrich the results. Inferential analysis: This part of the analysis aims to present and interpret the results and infer from them in order to reach the study objective, by conducting the Chi Square test of independence to study whether there is a relationship between two descriptive variables by applying the Chi Square statistic.

RESULTS

Descriptive Analysis:

Our study included 141 patients who underwent cesarean section under spinal anesthesia. Table 1 shows the distribution of patients by age group, as follows: 95 (67.4%) were aged 20-30 years, 42 (29.8%) were aged 31-45 years, and 46-60 years (2.8%). Their ages ranged from 21-58 years, with a mean age of 29 years and a standard deviation of 6.8. Table 2 shows the distribution of patients by body mass index, as follows: 92 (65.2%) were aged 18.5-24.9 years, 31 (22%) were aged 25-29.9 years, and 18 (12.8%) were aged 30-39.9 years.

Table 3 shows the distribution of patients according to their economic status: "Good" 77 (54.6%), "Very Good" 43 (30.5%), "Excellent" 15 (10.6%), and "Weak" 6 (4.3%). Table 4 shows the patients' responses regarding their suffering from chronic diseases. Most of them answered "No" (130% of the patients (92.2%), compared to "Yes" (11% of the patients (7.8%). Table 5 shows that most of them do not suffer from migraines (135% of the patients (95.7%)), compared to 6 (4.3%) who do. Table 6 shows that those who take only neurological medications (4% of the patients (2.8%)), compared to 137 (97.2%) who do not.

Table 7 shows that, according to the American Society of Anesthesiologists (ASA) classification, 135 (95.7%) of patients fell into the "ASA" category, and 6 (4.3%) fell into the "ASA" category. Table 8 shows that 69 (48.9%) of patients had previously undergone spinal anesthesia, compared to 72 (51.1%) who answered "no."

Table 9 shows that 45 (31.9%) of patients had a history of headaches after spinal anesthesia, compared to 96 (68.1%) who did not experience headaches. Table 10 shows that 5 (3.5%) of patients currently had headaches after spinal anesthesia, compared to 136 (96.5%) who did not experience headaches.

Table 11 shows the position of the patients undergoing spinal anesthesia: 89 (63.1%) were in the sitting position, compared to 52 (36.9%) in the supine position. Table 12 shows the number of attempts to insert the needle was as follows: 103 (70%) were in the "once" position, and 32 (22.7%) were in the "twice" position. Table 13 shows that 125 (88.7%) patients reported that the block was completely successful.

Table 14 shows the academic level of those performing the spinal block: 63 (44.7%) were physicians, compared to 78 (55.3%) anesthesia technicians. Table 15 shows the symptoms experienced by patients after undergoing spinal anesthesia, which were as follows:

"nausea/vomiting" in 100 (48.3%), "tinnitus" in 37 (17.9%), "foveal rigidity" in 32 (15.5%), and "double vision" in 23 (11.1%)**.**

Inferential Analysis

The Chi-square test of independence was used to determine whether there was a relationship between two descriptive variables. The chi-square statistic was used to determine statistical significance if the p-value was <0.05.

Table 16 shows a study of the headache incidence in relation to the anesthesia position. The percentage of patients who experienced headache was higher in the sitting position (2.8%) compared to the supine position, but the difference was not statistically significant (P-Value >0.05).

Table 17 shows a study of the headache incidence in relation to the number of attempts. The percentage of patients who experienced headache was higher in the first attempt than in the second, but the difference was not statistically significant (P-Value >0.05).

Table 18 shows a study of headache incidence in relation to the academic level of the person performing the procedure. The proportion of patients who experienced headaches was higher when the procedure was performed by an anesthesiologist than by a physician, but the difference was not statistically significant (P-value >0.05).

Table 16 shows a study of headache incidence in relation to body mass index (BMI). The proportion of patients who experienced headaches was higher in the 18.5-24.9 category, followed by the 30-39.9 category, but the difference was not statistically significant (P-value >0.05).

Tables:

Table 1

		N	%
Age groups	20-30	95	67.4
	31-45	42	29.8
	46-60	4	2.8
Total		141	100
Minimum	**Maximum**	**Mean**	**Std. Deviation**
21	58	29.37	6.812

Table2

		N	%
BMI	18.5-24.9	92	65.2
	25-29.9	31	22
	30-39.9	18	12.8
T	otal	141	100

Table3

		N	%
Economic status	Excellent	15	10.6
	Very good	43	30.5
	Good	77	54.6
	Poor	6	4.3
Total		141	100

Table4

		N	%
Do you suffer from chronic diseases?	Yes	11	7.8
	No	130	92.2
Total		141	100

Table5

		N	%
Do you suffer from migraines?	Yes	6	4.3

	No	135	95.7
Total		141	100

		N	%
Are you taking any neurological medications?	Yes	4	2.8
	No	137	97.2
Total		141	100

		N	%
The classification that suits your health condition	ASA1	135	95.7
	ASA2	6	4.3
Total		141	100

		N	%
Have you ever had spinal anesthesia?	Yes	69	48.9
	No	72	51.1
Total		141	100

		N	%
Have you ever experienced a headache after spinal anesthesia?	Yes	45	31.9
	No	96	68.1
Total		141	100

		N	%
Are you experiencing headaches after spinal anesthesia?	Yes	5	3.5
	No	136	96.5
Total		141	100

		N	%
Position under anesthesia?	Sitting	89	63.1
	Lying	52	36.9
Total		141	100

		N	%
Number of attempts?	Once	103	73
	Twice	32	22.7
	Three times	4	2.8
	Four times	2	1.4
Total		141	100

		N	%
Successful blockade?	Yes	125	88.7
	No	16	11.3
Total		141	100

		N	%
Academic level of the person performing the procedure?	Doctor	63	44.7
	Anesthesia Technician	78	55.3
Total		141	100

		N	%
Associated symptoms	neck stiffness	32	15.5%
	Tinnitus	37	17.9%

	Double vision	23	11.1%
	Photophobia	15	7.2%
	Nausea and/or vomiting	100	48.3%
Total		207	100.00%

			Are you experiencing headaches after spinal anesthesia?		Total
			Yes	No	
Position under anesthesia?	Sitti ng	Count	4	85	89
		% of Total	2.80%	60.30%	63.10 %
	lyin g	Count	1	51	52
		% of Total	0.70%	36.20%	36.90 %
Total		Count	5	136	141
		% of Total	3.50%	96.50%	100.0 0%
P-Value=0.4					

			Are you experiencing headaches after spinal anesthesia?		Total
			Yes	No	
Number of attempts?	Once	Count	3	100	103
		% of Total	2.10%	70.90%	73.00 %
	Twice	Count	2	30	32
		% of Total	1.40%	21.30%	22.70 %
	Three times	Count	0	4	4
		% of Total	0.00%	2.80%	2.80%
	Four times	Count	0	2	2
		% of Total	0.00%	1.40%	1.40%
Total		Count	5	136	141
		% of Total	3.50%	96.50%	100.00 %
P-Value=0.7					

			Are you experiencing headaches after spinal anesthesia?		Total
			Yes	No	
What is the academic level of the person performing the procedure?	Doctor	Count	2	61	63
		% of Total	1.40%	43.30%	44.70 %
	Anesthesia Technician	Count	3	75	78
		% of Total	2.10%	53.20%	55.30 %
Total		Count	5	136	141
		% of Total	3.50%	96.50%	100.0 0%
P-Value=0.8					

			Are you experiencing headaches after spinal anesthesia?		Total
			Yes	No	
Body mass index	18.5-24.9	Count	4	88	92
		% of Total	2.80%	62.40%	65.20 %
	25-29.9	Count	0	31	31
		% of	0.00%	22.00%	22.00 %

		Total			
	30-39.9	Count	1	17	18
		% of Total	0.70%	12.10%	12.80 %
Total		Count	5	136	141
		% of Total	3.50%	96.50%	100.00 %
P-Value=0.2					

DISCUSSION

Currently, 80-95% of cesarean deliveries are performed under spinal anesthesia due to its simplicity, rapid onset, and excellent sensory and motor blocking due to maternal alertness during delivery and early breastfeeding. It also provides good postoperative analgesia, avoiding airway obstruction and the risk of aspiration.[1-4]

Although spinal anesthesia is considered safe, it is not free of complications. The most common complication of spinal anesthesia is post-dural puncture headache, which is associated with dura mater puncture and cerebrospinal fluid leakage.[5-8]

The primary cause of post-dural puncture headache is cerebrospinal fluid leakage, which occurs acutely within minutes to several hours. This is associated with sudden cerebrospinal fluid leakage and decreased cerebrospinal fluid pressure, ultimately leading to gravitational stress on pain-sensitive structures and displacement of intracranial structures. In addition, the occurrence of post-dural puncture headaches secondary to cerebrospinal fluid leakage is a result of activation of adenosine receptors, which subsequently causes dilation of intracranial arteries and veins as a compensatory increase in blood volume through the canal of Monro [ ]. Evidence has also revealed that the incidence of post-dural puncture headaches ranges from 0 to 42.6% after spinal anesthesia and 81% after accidental puncture.[12]

The incidence of post-dural puncture headaches in our study was 3.5%, which is lower than in studies conducted in eastern Ethiopia, Kenya, Cairo, Egypt, and elsewhere due to the different sample sizes.[9 - 11]

In these studies, needle size, number of attempts, body mass index, needle direction, and anesthesiologist experience were significantly associated with the occurrence of post-dural puncture headaches. In our studies, participants had difficulty determining the needle size used due to their lack of knowledge of the procedure.

Repeated attempts increase the incidence of post-dural puncture headaches by 1.5 to 4 times compared to a single attempt. In our study, the number of attempts ranged from one to two, with one case undergoing four attempts. According to Dawit et al., mothers who underwent a single spinal anesthesia had a 62.6% lower risk of developing post-dural puncture headaches than mothers who underwent multiple spinal anesthesia attempts.[12] An Ethiopian study[12] reported that spinal anesthesia performed by an anesthesiologist with more than 3 years of experience reduced the incidence of post-dural puncture headaches by 56% compared to an anesthesiologist with less than 3 years of experience. This finding differs from other studies, which have shown that anesthesiologists' experience is not associated with post-dural puncture headaches. In our study, the incidence of headaches was higher when performed by an anesthesia technician than by an anesthesiologist. In our findings, a body mass index (BMI) greater than 30 kg/m² increased the incidence of post-dural puncture headaches by 2.85 times. In our results, a BMI greater than 30 kg/m² increased the incidence of post-dural puncture headache by 2.85 times[16]

Our study did not demonstrate an association between these factors (number of attempts, experience of the practitioner, BMI, and patient positioning during the procedure) and the incidence of post-dural puncture headache. This is primarily due to the difference in sample sizes between these studies.

CONCLUSION

In our study, the incidence of post-dural puncture headache was 3.5%. Studies show that factors such as needle size, number of attempts, body mass index, and anesthesiologist experience are associated with increased headache incidence. Repeated attempts were observed to increase the likelihood of headache by 1.5 to 4 times. Headache rates were higher when anesthesia was administered by an anesthesiologist compared to an anesthesiologist. Our study did not demonstrate an association between these factors and headache incidence, possibly due to the difference in sample sizes.

Declarations Ethical statement

The ethical consent was obtained from Syrian private university ethical committee Competing Interest: the authors declare no competing of interests.

Availability of data and materials

All data are available from the corresponding author on reasonable request.

Funding
This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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