Effect of Supine versus Sitting Position on Post-Dural Puncture Headache among Patients Receiving Spinal Anesthesia

Engy E. Eldoushy
Assistant professor of Medical Surgical Nursing Faculty of Nursing, Menoufia University, Egypt
*Corresponding author: enjy.eldaoshi@nursing.menofia.edu.eg
or: engyeldoushy2016@gmail.com

Abstract

Background: One of the most commonly reported complications associated with spinal anesthesia is post-dural puncture headache, even while, the precise mechanisms causing post-dural puncture headache are still not well known**,** which if left untreated, can lead to severe complications such as subdural hematoma and convulsions. **The aim of the current study was to** evaluate the effect of supine versus sitting position on post-dural puncture headache among patients receiving spinal anesthesia. **Design:** A quasi-experimental research design **Sitting:** The present study was carried out at the Menoufia University Hospital's urology and orthopedic surgery departments, Menoufia Governorate, Egypt. **Subjects:** A purposive sample of 100 adult patients with spinal anesthesia who volunteered to participate in the study and met the inclusion criteria were randomly divided evenly into two study groups**. Tools:** For data gathering, three instruments were utilized in this study are**: 1.Patients' characteristics questionnaire** was used to analyze their sociodemographic features, as well as their past, present, and family medical history **2. Visual Numerical Analogue Scale (VAS)** was adopted for headache Severity evaluation **3.Headache Impact Index** had been adopted to grade severity of post-dural puncture headache's associated complications**. Results:** There were a statistically significant decrease in post-dural puncture headache's incidence, severity and associated complications among supine position group (study group I) subjects than among sitting position group (study group II) subjects with statistically significant differences existed between the two studied groups. **Conclusion:** Maintaining patients in supine position for the first 72 hours post spinal anesthesia as a management technique significantly improved their post-dural puncture headache's incidence, severity and associated complications. **Recommendations:** Designing a plan of care for post-spinal anesthesia patients should include positioning as a simple management technique that could lead to preferable effects regarding their post-dural puncture headache's incidence, severity and associated complications. Replication of the current study on a larger sample size and for longer follow-up period to allow for results' generalization

Key Words: Post-Dural Puncture Headache, Spinal Anesthesia, Sitting Position, Supine Position

Introduction:

Postdural puncture headache (PDPH) is a significant consequence of spinal anesthesia, which is the most frequent anesthetic technique used in numerous surgical procedures **(Tubben et al., 2021)**. PDPH is becoming a prominent cause of morbidity in patients receiving spinal anesthesia and is considered the third most common reason for anesthesiologist malpractice lawsuits ***(Mathur et al., 2018)***. Although rates of up to 70% have been reported, PDPH incidence can be challenging to measure in clinical practice ***(Manuel et al., 2022)***. According to ***The International Headache Society (2021)***, the prevalence of headache following lumbar puncture (PDPH), which might persist for several days, is high (32%) and, in some cases, be so severe as to render the patient immobile, and if left untreated can lead to fatal complications like subdural hematoma and seizures **(Uchino, 2018)**. Young adults, particularly females with lower body mass indices, are more likely to develop PDPH that typically begins between the first 24 and 72 hours after spinal anesthesia and can last up to 12 days **(Nath et al., 2018)**.

Although the precise mechanism is unknown, there are two plausible theories; first, reducing cerebrospinal fluid (CSF) pressure exerts tension on intracranial structures. These structures are sensitive to pain, which causes the typical headache. Second, a compensatory vasodilatation results from the escape of CSF **(Karaman et al., 2020)**.

The existence of a number of predisposing factors such as; young age, past history, low body mass index (BMI), feminine sex and patient experiencing high levels of stress during the procedure. Aside from operational criteria such as needle size, needle tip shape, dural fiber bevel orientation, number of lumbar puncture attempts, midline versus lateral lumbar puncture method, type of the given anesthetic

solution, and the anesthesiologist's clinical experience, all may act as a contributory factors for the PDPH's increased incidence **(Akdemir et al., 2021)**. It has been determined that the usage of 27G Quincke spinal needle or smaller for dural puncture seemed to reduce PDPH's incidence at the same time the patient's position taken following spinal anesthesia contributes to the development of PDPH **(Plewa & McAllister, 2022)**.

As a first line of treatment, NSAIDs, such as Paracetamol and acetaminophen, often utilized as a symptomatic analgesics. Pharmacological therapy also includes antiemetics and medications that stimulate cerebrospinal fluid (CSF) production in addition to opiates such as codeine and tramadol, are regularly used to relieve symptoms in severe cases **(Gaiser, 2021&Yan et al., 2020)**.

During a headache, patient should be advised to lie down in a comfortable position and although maintaining supine position after the headache's start is not supported by clinical research, but supine position usually recommended as it may alleviate headache through increasing the intra-abdominal pressure, which is conveyed to the epidural space **(Sayed et al., 2019)**.

Nurses play a vital role in the management and care for patients with PDPH through five main tasks are; documenting patients' medical history, educating them about their diagnosis, taking part in follow-up appointments, maintaining the proper application of rescue techniques as well as the regular and effective administration of acute medications and can assist in creating support groups for headaches management ***(Rosdahl & Kowalski, 2018)***. Additionally, the history-taking should consist a detailed description of the patient's headaches, allergies, medications, past medical and surgical history, social history, habits, sleep, family history, quality of life, information about a disability, a review of symptoms, and, most importantly, what the patient hopes to gain from the given management care plan ***(Zajac, 2011)***.

Numerous clinical trials have examined the impact of posture during spinal anesthesia, but only a small number of studies have shown how it affects recovery from dural puncture's complications **(Mohammad et al., 2022)**.

Significance of the study:

Postdural puncture headache (PDPH) is a common side effect of spinal anesthesia, which is utilized in the majority of surgical procedures. PDPH is becoming a significant cause of morbidity in patients undergoing spinal anesthesia, and it is the third most common cause of anesthesiologist malpractice claims. Through examining the patients' admittance rates for the University Hospital, Menoufia Governorate, Egypt in 2022 revealed that during the course of the previous year, roughly 1400 cases required a certain type of operation under spinal anesthesia. Additionally, PDPH was reported by nearly 85% of those patients after spinal anesthesia that may provide a negative experience with spinal anesthesia, making patients afraid to use it again, prevent early recovery and/or self-care ***(Statistical Records of Menoufia University Hospital's surgery departments of urology and Orthopedic , Menoufia Governorate, Egypt, 2022).***

Furthermore, numerous clinical trials have examined the impact of posture during spinal anesthesia, but only a small number of studies have shown how it affects recovery from dural puncture's complications. Consequently, this study's goal was to assess the effect of supine versus sitting position on post-dural puncture headache among patients receiving spinal anesthesia.

Aim of the Study

The current study aimed at evaluating the effect of supine versus sitting position on post-dural puncture headache among patients receiving spinal anesthesia.

Research hypotheses:

To accomplish the current study's aim the following research hypotheses were formulated:

1. Patients who maintain supine position for the first 72 hours post spinal anesthesia (study group I) will exhibit a decreased severity of post-dural puncture headache than sitting position group patients (study group II) will do.
2. Patients who maintain supine position for the first 72 hours post spinal

anesthesia (study group I) will exhibit a decreased post-dural puncture headache's associated complications than sitting position group patients (study group II) will do.

3. A statistical significant difference with reference to the severity of post-dural puncture headache and its associated complications will exist between the two study groups, supine position group (study group I) and sitting position group (study group II)

Operational definitions:

Postdural puncture headache (PDPH): This terminology has been officially defined according to the International Classification of Headache Disorders**,** as "bilateral headache that occurs within 48 hours after a lumbar puncture and can be resolved within 14 days", ***(Amin et al., 2014)***. Additionally, it is referred to as a potential anticipated complication of a lumbar puncture, with symptoms associated with traction on pain-sensitive regions, which results from low cerebrospinal fluid (CSF) pressure (intracranial hypotension) following a leak of CSF at the puncture site ***(The International Headache Society, 2021)***.

Supine Position: Is one of the four basic patients' positions. Lithotomy, lateral, and prone are the three other positions. In supine position, the patients are lying on their back with their face up, while supporting head and shoulders to be slightly elevated through resting them on one pillow to maintain neck in a neutral position. The patients' arms can be placed on arm boards with thumbs up or supinated or they can be tucked at their sides or slightly abducted to a less than 90 degrees ***((Rosdahl & Kowalski, 2018 and Berman et al., 2018)***.

Sitting Position: In this position, the patient is supported to sit-up straight in bed with the aid of a backrest and pillows. In order to ensure more comfort for the patient, a tiny pillow is placed under his/her knees and a small pillow is placed on an over-the-bed table in front of patient's chest to rest on it ***(Miranda et al., 2016 and Rosdahl & Kowalski, 2018)***.

Subjects and Methods:

Research design: This study used a quasi-experimental research design, which involves the manipulation of an independent variable without the random assignment of participants, and generally has a higher internal validity than correlational studies but lower than genuine experiments.

Setting: The current study was carried out at the Menoufia University Hospital's urology and orthopedic surgery departments, Menoufia Governorate, Egypt. The collection of data took place over a 5-month period, beginning in December 2021 and ending in April 2022.

Sample: From the previously mentioned setting, 100 adult patients who are scheduled for spinal anesthesia were chosen as a purposive sample, then equally divided into two study groups (50 patients each).

Study group I (supine position group): Patients were maintained in supine position for the first 72 hours post-spinal anesthesia.

Study group II (sitting position group): Patients were maintained in sitting position for the first 72 hours post-spinal anesthesia.

Inclusion criteria:

- Adult (within the age range of 20 - 40 years)
- Male or female
- Scheduled for spinal anesthesia with 27 Quinke G needle
- A successful spinal anesthesia attempt in the first insertion with no failed attempts
- BMI < 35
- Alert and able to communicate

Exclusion criteria: -

- Have a prior history of spinal anesthesia
- Chronic use of analgesics
- Have previous neurosurgery
- Have history of chronic headaches (migraine), diabetes, hypertension, coagulation disorders, psychological disorders, and skeletal anomalies in the vertebral column.

Sample size calculation:

The following formula was used to determine the current study's sample:

Sample Size (n) = N x [Z^2 x p x (1-p)/e^2] / [N – 1 + (Z^2 x p x (1-p)/e^2] where,

- N = Population size,

- Z = Critical value of the normal distribution at the required confidence level,
- p = Sample proportion,
- e = Margin of error
- CI=95% and power=90% (10% dropout)

Tools of the study:

For the purpose of collecting data for the current study, three instruments were used;

Tool I: Patients' characteristics questionnaire:

The researcher created this instrument to analyze patients' demographic features, as well as their past and present medical history through its two parts**:**

Part 1: Patients' sociodemographic features: Utilized to assess patients' age, gender, weight and height to calculate their Body mass index (BMI)

Part 2: Medical history: Utilized to appraise the inclusion and exclusion criteria through assessing patients' past and present medical history, such as chronic diseases including diabetes, hypertension, coagulation disorders, psychological disorders, skeletal anomalies and previous history of; spinal anesthesia, PDPH or chronic headaches.

Tool II: Visual Numerical Analogue Scale (VAS) was adopted from **(Warden et al., 2003)** for headache Severity evaluation the scale ranged from 0-10 where, a score of "0" indicated absence of PDPH, (1-3) indicated mild PDPH, (4-6) indicated moderate PDPH, while a score of (7-10) indicated severe PDPH.

Tool III: Headache Impact Index was adopted from ***(Turnbull & Shepherd, 2004)*** to grade severity of post-dural puncture headache's associated complications; including paresthesia; is numbness or burning sensation felt by patient in buttocks or lower limbs after insertion of spinal needle, stiff neck, nausea, vomiting, tinnitus, backache and the need for dural blood patch or extra analgesics. the index includes five questions answered on five-points Likert scale where; never is giving 0, rarely =1, sometimes =2, very often =3 and always =4 for assessing the previously mentioned complications. The total score is out of 20 with higher scores denoting increased severity of PDPH's associated complications, scores are categorized into three severity levels are:

Grade	Criteria
Mild	No limitation of activity No treatment required
Moderate	Limited activity Regular analgesics required Convenient treatment required
Severe	Confined to bed Anorexic

For the Total score of Headache Impact Index:

- 0 = no PDPH's associated complications
- (1-6) = mild severity of PDPH's associated complications
- (7-13) = moderate severity of PDPH's associated complications
- (14-20) = severe PDPH's associated complications

Methods:

The present study lasted five months, commencing on December 2021 and finishing on April 30, 2022.

Approval: An Approval was obtained from the Institutional Ethics Committee of the Faculty of Nursing at Menoufia University, with protocol No. 854/9.10.2021 and an official letter outlining the existing study's purpose and data collection methods was obtained from the Dean of the Faculty of Nursing at Menoufia University, then it was forwarded to the administrator of the Menoufia University Hospital, as well as it was delivered to the chief executive, the director and the head nurses of Menoufia University Hospital's surgery departments of urology and Orthopedic , Menoufia Governorate, Egypt to get their endorsement before conducting this study

Human rights and ethical considerations: Only patients who accepted to participate and met the inclusion and exclusion criteria were selected. During the initial interview, (one-day preoperative), after explaining the aim of the study, all respondents from both groups gave their informed consent. The researcher emphasized the privacy through coding the collected data and the voluntariness of study participants, who are free to discontinue participation in the study at any time, also ensure that the instruments caused no physical or emotional harm to the participants.

Validity of the tools: To ensure the appropriateness and thoroughness of the current study tools, jury of seven experts in the field of (Medical Surgical Nursing, Anesthesia, Medical Statistics, English Specialty and a Clinical surgical nurse specialist) tested and modified all instruments for content validity.

Reliability: The internal consistencies of both **Visual Numerical Analogue Scale (VAS)** and **Headache Impact Index** were computed using Cronbach's alpha coefficients, and the values were of 0.93 and 0.94, respectively, suggested strong reliability, while the internal ICCs for **Visual Numerical Analogue Scale (VAS)** and **Headache Impact Index** varied from 0.82 to 0.91 and 0.79 to 0.96, respectively, for test-retest reliability

Pilot study: In order to examine the present study's tools for their simplicity, fairness, accuracy, appropriateness, expediency, and relevancy prior to data collection, a pilot study including ten patients (10%) was conducted. In addition, it was done to see if there would be any obstacles or problems that might come up throughout the process of data collection, as well as to estimate the precise amount of time required by each patient to complete the study tools, which aided in making the necessary adjustments. The data of the pilot study were excluded from the current study's conclusions.

Data collection Procedure:

Feasibility visits were undertaken at the Menoufia university hospital's urology and orthopedic surgery departments, Menoufia Governorate, Egypt, with the intention of recruiting participants for this study.

The researcher conducted four separate interviews with each patient who participated in this study; the first interview took place the day before spinal anesthesia, the second was within 24 hours after leaving the recovery room, while the third was 48 hours post-spinal anesthesia and the fourth was 72 hours post-spinal anesthesia. It took roughly 20 minutes to complete each interview.

During the first interview, preoperatively, researcher used tool I, individually, with each participant of both study groups to learn about their sociodemographics, as well as their past and present medical history, then instructed each patient about the position that should be maintained for the first 72 hours post-spinal anesthesia; for study group I supine position and for study group II sitting position

All patients of both studied groups in the operating room underwent regular monitoring, such as non-invasive blood pressure, pulse oximetry, and electrocardiography. They also received a pre-hydration of 10 mL/kg crystalloid solution before spinal anesthesia.

One anesthesiologist, a member of the surgical crew, administered spinal anesthesia for all study participants' through the midline approach at the L3-L4 intervertebral space with standard precautions applied during the procedure and the utilized spinal needles were 27 G Quincke that inserted with the bevel parallel to the dura-matter's longitudinal fibers. After positioning the patient for lumbar puncture in the left lateral position, 0.5% hyperbaric Bupivacaine as local anesthetics were injected within 10-15 seconds in a dosage of 0.06-0.07 mg cm-1 of patient height and adjuvants were, 10 g of Fentanyl and 120 g of morphine.

Postoperatively, researcher interviewed participants from both studied groups three times; the second, third and fourth interviews. Where, the researcher questioned every patient using tool II to measure the severity of PDPH and tool III to assess the occurrence of any associated symptoms including; neck stiffness, nausea/vomiting, backache, tinnitus and whether they needed extra analgesics or had used an epidural blood patch.

Results of the two studied groups were compared in order to evaluate the effectiveness of supine versus sitting positions on PDPH's severity and related symptoms.

III. Statistical Analysis

The gathered data were organized, tabulated, and statistically analyzed using SPSS software (Statistical Package for Social Sciences, version 21, SPSS Inc. Chicago,IL, USA). The range, mean, and standard deviation were computed for quantitative data, while the Chi-square test (x^2) was employed for qualitative data to compare across the two studied groups. The paired t-test was used to compare the means of two related sets of parametric data (pre- and post-test data), while Pearson's correlation coefficient (r) was used to measure the correlation between variables. $P < 0.05$ was established as the significance level for interpretation of the results.

Results

According to table (1), there was a statistically significant difference existed between the two studied groups regarding patients' height as P=0.001. While, no statistically significant differences existed between the two studied groups for any other sociodemographic features where the participants' mean age was 26.4 ±2.1 years for patients of study group I and 24.3 ± 2.3 years for group II patients. The majority of the studied patients were females, in the in the age range of 20-30 years, their weight range of 85-100 Kg, their height ranged between 150-160cm, and 51% of them had BMI range of 30-<35 with a mean range of 32.1 ±3.91 and 30.6 ± 4.21, respectively for patients of study group I and group II.

Based on table (2), there was a strong statistically significant correlation between patients' positioning and severity of PDPH among studied patients, with a P value of 0.000. The majority 64% of participants in study group I had mild PDPH compared to 44% of participants in study group II had moderate PDPH and the mean range was 50.74± 1.93 and 50.07± 0.96 respectively, for study group I and II.

According to table (3), there were no statistically significant differences regarding correlation between PDPH's associated complications and patients' positioning among studied patients with a P value of 0.069 and the mean range for study group I and II, respectively, was 50.77± 1.84 and 50.03± 1.86. The major complain among studied patients was backache comprised 61%, followed by 44% for nausea/vomiting, and only 13% of studied patients used dural blood patch, while concerning the need for extra-analgesics, only 9% needed Tramadol and 6% needed Codeine.

According to table (4), in both study groups, the association between patients' sociodemographic features and their PDPH's severity level was statistically significant, with a total mean of 26.47± 3.19 and 79.13± 0.54 for study group I and II, respectively and the P value was 0.001. In addition, the patients' mean age ranged between 28.7± 0.44 and 29.3± 0.27 and the P values were 0.021 and 0.001, respectively, for study group I and II. At the same time a statistical significance was observed in the relationship between patients' gender and their PDPH's severity level among study group I as P value was <0.001, while no significance observed for study group II and the gender mean range was 21.2± 36.31 and 107.1± 62.49 respectively, for study group I and II. However, there was no statistically significant relationship observed for either of the studied groups regarding patients' BMI and their PDPH's severity level and the BMI mean ranges were 31.4± 1.12 and 32.3± 1.24 respectively, for study group I and II.

According to table (5), the relationship between patient's PDPH severity level and post-spinal anesthesia days was found to be statistically significant among both studied groups with spinal anesthesia for the first 24 hours post-spinal anesthesia, where P values were 0.003 and <0.001and the means ranged between 36.3± 2.1 and 39.1± 0.4 for study group I and II, respectively. In addition, a strong significant correlation noted among patients of study group I during the next 48 hours and 72 hours post-spinal anesthesia in relation to their PDPH's severity level as P value were <0.001 and 0.000, respectively, while no significant correlation observed for patients of study group II.

Table 1: Sociodemographic features of studied patients (n=100)

Sociodemographic features		Groups: Supine position (study group I) (n=50) No	%	Groups: Sitting position (study group II) (n=50) No	%	Total No	%	P value
Age groups	20 - < 30 Y	29	58%	23	46%	52	52%	χ^2=7.6, P=0.06 **NS**
	30- ≤ 40Y	21	42 %	27	54%	48	48%	
X ± SD		**26.4±2.1 years**		**24.3±2.3 Y**				t=1.5,P=0.07 NS
Sex	Male	22	44%	24	48%	46	46%	Fisher exact test=0.24 **NS**
	Female	28	56%	26	52%	54	54%	
Weight per Kg	70-< 85	24	48%	19	38%	43	43%	χ^2=2.9, P=0.04 **NS**
	85-100	26	52%	31	62%	57	57%	
Height per cm	150-160	33	66%	27	54%	60	60%	χ^2=21.2, P=0.001 **S***
	161-170	17	34%	23	46%	40	40%	
BMI	25 – <30	23	46%	26	52%	49	49%	LR=1.47,P=0.09 **NS**
	30 – <35	27	54%	24	48%	51	51%	
X ± SD		**32.1±3.91**		**30.6±4.21**				t=3.8,P=0.971 NS
Total		**50**	**100%**	**50**	**100%**	**100**	**100%**	

(S*) Statistically significant at P < 0.05 **NS**= not significant **LR=** Likelihood ratio

Table 2: Association between positioning and severity of PDPH among studied patients

Severity of PDPH	Studied Groups: Supine position (study group I) (n=50) No	%	Sitting position (study group II) (n=50) No	%	χ^2	P-value
Mild	32	64.0	17	34.0	64.09	P=**0.000** HS *
Moderate	13	26.0	22	44.0		
Severe	5	10.0	11	22.0		
X ± SD	**50.74± 1.93**		**50.07± 0.96**		t=**8.34**	

(*) Statistically significant at P < 0.05 **t=student t test** HS= **highly significant**

Table 3: Distribution of PDPH's associated complications in relation to patient's position (n=100)

Sociodemographic features		Groups				Total		P value
		Supine position (study group I) (n=50)		Sitting position (study group II) (n=50)				
		No	%	No	%	No	%	
Paresthesia		7	14%	11	22%	18	18%	χ^2=5.2, P=0.07 NS
Stiff neck		13	26%	17	34%	30	30%	t=1.38, P=0.06 NS
Nausea/vomiting		21	42%	25	50%	46	46%	Fisher exact test=0.27 NS
Tinnitus		6	12%	14	28%	19	19%	LR=1.56,P=0.44 NS
Backache		29	58%	32	64%	61	61%	Fisher exact=0.36 NS
Dural blood patch		4	8%	9	18%	13	13%	Fisher exact =0.42 NS
Extra analgesics	Paracetamol	17	34%	10	20%	27	27%	LR=0.09,P=0.7 NS
	Acetaminophen	12	24%	16	32%	28	28%	Fisher exact= 0.33 NS
	Tramadol 50mg	2	4%	7	14%	9	9%	
	Codeine	1	2%	5	10%	6	6%	
X ± SD		50.77± 1.84		50.03± 1.86		t=**8.34** , P=**0.069** NS		
Total		**50**	**100%**	**50**	**100%**			

(*) Statistically significant at P < 0.05 **NS**= not significant **t=student t test**

Table 4: Association between patient's sociodemographic features and their PDPH's severity level among both study groups (n = 100)

Patient's sociodemographic Features	Patient's PDPH severity Level													
	Supine position group (study group I) (n=50)							Sitting position group (study group II) (n=50)						
	Mild (n=32)		Moderate (n=13)		Severe (n=5)		Chi square test χ^2	Mild (n=17)		Moderate (n=22)		Severe (n=11)		Chi square test χ^2
	n	%	n	%	n	%		n	%	n	%	n	%	
Age (years)							χ^2=7.743 P=0.021 *							χ^2=6.419 <0.001 *
20 – <30	21	65.63	7	53.84	1	20		9	52.9	12	54.5	**2**	**18.18**	
30 – <40	11	34.37	6	46.16	4	80		8	47.1	10	45.5	9	81.82	
Mean±SD	28.7±0.44							29.3±0.27						
Gender														
Male	14	43.7	5	38.4	3	60	X^2=14.835 P<0.001 *	7	41.2	13	59.1	4	36.4	χ^2=0.981 0.322
Female	18	56.3	8	61.6	2	40		10	58.8	9	40.9	7	63.6	
Mean±SD	21.2±36.31							107.1±62.49						
BMI														
25 – <30	17	53.1	4	30.7	2	40	χ^2= 0.594 0.829	10	58.8	9	40.9	7	63.6	χ^2= 2.315 0.764
30 – <35	15	46.9	9	69.3	3	60		7	41.2	13	59.1	4	36.4	
Mean±SD	31.4±1.12							32.3±1.24						
X ± SD(total)	**26.47± 3.19**							**79.13± 0.54**						
	t=8.34 LR =14.3 P=<0.001*													

(*) Statistically significant at P < 0.05 t=student t test LR=likelihood ratio

Table 5: Distribution of patient's PDPH severity level in relation to post-spinal anesthesia days among studied groups with spinal anesthesia

Post-Spinal anesthesia days	Patient's PDPH severity Level													
	Supine position group (study group I) (n=50)							Supine position group (study group II) (n=50)						
	Mild (n=32)		Moderate (n=13)		Severe (n=5)		Chi square test χ^2	Mild (n=17)		Moderate (n=22)		Severe (n=11)		Chi square test χ^2
	N	%	n	%	n	%		N	%	N	%	n	%	
First 24 hours	5	15.6	7	53.9	3	60.0	χ^2=4.341 P=0.003*	8	47.1	10	45.5	2	18.2	χ^2=11.212 P<0.001*
Mean±SD	36.3±2.1							39.1±0.4						
After 48 hours	12	37.5	4	30.7	2	40.0	X^2=14.835 P<0.001*	9	52.9	7	31.8	5	45.4	χ^2=23.8 0.322
Mean±SD	29.1±5.6							29.8±11.5						
After 72 hours	15	46.9	2	15.4	0	0.0	χ^2= 0.459 P=0.000*	0	0.0	5	22.7	4	36.4	χ^2=26.3 0.676
Mean±SD	23.4±7.14							27.6±12.3						

(*) Statistically significant at P < 0.05

Discussion

Spinal anesthesia usually associated with post-dural puncture headache which is the prominent complain among those patients with 90% of headaches start during the first three days of the dural puncture, and 66% begin within the first 48 hours and in rare cases, only in 4%, the headache appears 5 to 14 days following the surgery. Headache could develop right away after dural puncture subsequently physician should consider other possible explanations since this is uncommon **(Gaiser, 2021 & Akdemir et al., 2021)**.

Regarding patients' socio-demographic features results of the current study revealed that there was a statistically significant difference existed between the two studied groups regarding patients' height while, no statistically significant differences existed between the two studied groups for any other sociodemographic features. Additionally, the majority of the studied patients were females, in the age range of 20-30 years, their weight range of 85-100 Kg, their height ranged between 150-160cm, and had BMI range of 30-<35 with a mean range of 32.1 ±3.91 and 30.6 ± 4.21, respectively for patients of study group I and group II.

These findings concurred with those of ***Alexandre et al., (2021)*** who investigated "the Long-term complications of unintentional dural puncture during labor with epidural analgesia" and found that "there were no statistical significant differences between study and control groups regarding patients' demographic and clinical data; age, body mass index". In contrast, ***Kurnutala et al., (2019)*** disagreed with these findings as they noticed in their research "an increased incidence of PDPH in the peak age of 30-45 years old". At the same time and according to ***Mohammad et al., (2022)*** who assessed the "Effect of Position during Spinal Anesthesia on Postdural Puncture Headache" disagreed with findings of the present study as they illustrated "Patients' weights were less than 80 kg and their body mass indices were less than 30". These discrepancies in findings may be attributable to the variance in age and BMI's inclusion and exclusion criteria used in the current study that was conducted by the researcher with the intention of examining cases suffering from PDPH.

Regarding association between patients' positioning and their PDPH's severity level the present study pointed up that there was a strong statistically significant correlation between patients' positioning and severity of their PDPH furthermore, the majority of supine position group participants reported mild PDPH's severity compared to moderate PDPH's severity among sitting position group participants.

These results were corroborated by **Miranda *et al., (2016)*** who mentioned in their research about "Surgical positioning: nursing care in the trans-operative period" that" patient's positioning could affect incidence and severity of headaches after spinal anesthesia"**.** In addition, according to ***Bandatmakur et al., (2021)***'s study, which also confirmed these results when they reported, "One of the predisposing factors for increased severity of post spinal puncture headache is positioning" besides**,** ***Cognat et al., (2021)*** had the same agreement with this study results when they "used positioning of their studied patient for preventing post-lumbar headache". All these agreements may be attributed to the fact that patients' positioning has a significant impact on incidence and severity of PDPH.

Regarding effect of patients' positioning on their PDPH's associated complications, the existent study approved that there were no statistically significant differences regarding correlation between PDPH's associated complications and patients' positioning among studied patients with a P value of 0.069 and the mean range for study group I and II, respectively, was 50.77± 1.84 and 50.03± 1.86. The major complain among studied patients was backache, followed by nausea/vomiting, and concerning the need for extra-analgesics, minority of studied patients used dural blood patch, Tramadol and Codeine.

Beckett, (2018), who asserted, "Positioning the patient for surgery is the core of care for preventing extra complications", supported these results and according to ***Ghaleb et al. (2019)'s*** research results approved that "severity of complications associated with post dural puncture headache is variant depending on the patient's placement during and after the procedure". On contrary ***Williams et al., (2018)*** contrasted the current study results as they illustrated that "position had no effect on post spinal anesthesia complications and only the amount of the CSF leakage is the main responsible for headaches, backaches and other complications following spinal anesthesia".

At the same line ***Park et al., (2020)*** is in contradiction with the findings of the current study as they stated in their research that" the leaking CSF is solely the cause of all associated symptoms that follow spinal anesthesia and the greater the amount of the CSF loss the harder the associated symptoms. These arguments may be related to that the size of the used needle in the current study was the smallest dural needle "27G" which ascertained by the researcher in the existent study's inclusion criteria that has a great advantage as it allow for a reduced amount of the lost CSF and consequently decreased levels of harm and associated complications. Besides, the limited number of the researched studies on the effect of positioning on PDPH after spinal anesthesia, as huge number of researcher focused on

evaluating its impact only during the procedure of spinal anesthesia.

Concerning association between patient's sociodemographic features and their PDPH's severity level among both study groups, the current study approved that in both study groups, the association between patients' sociodemographic features and their PDPH's severity level was statistically significant. In addition, the patients' mean age ranged between 28.7± 0.44 and 29.3± 0.27, respectively, for study group I and II. At the same time a statistical significance was observed in the relationship between patients' gender and their PDPH's severity level among supine position group (study group I) subjects, while no significance observed among sitting position group (study group II) subjects and the gender mean range was 21.2± 36.31 and 107.1± 62.49 respectively, for study group I and II. However, there was no statistically significant relationship observed for either of the studied groups regarding patients' BMI and their PDPH's severity level and the BMI mean ranges were 31.4± 1.12 and 32.3± 1.24 respectively, for study group I and II.

The current study's findings were supported by ***Robin et al., (2021)***, since they noted "a positive connection between PDPH and BMI. As compared to morbidly obese: obese and normal patients, after dural puncture, developed headaches at considerably lower rates". At the same line was ***Uchino, (2018)*** reported, "an elevated postdural headache incidence and severity in the age peak between the twenties and forties".

On the other hand, the discovered findings of the current study are incongruent with the literature stated, "Obesity act as a protective factor against PDPH development" **Sayed *et al.*, (2019).** Also, are dissimilar with what has been reported by **Akdemir *et al.*, (2019),** "Patients having a high BMI have a lower risk for the development of PDPH"**.** As well, it has been hypothesized by **Kurnutala *et al.*, (2019)** "Morbidly obese people have a lower risk of developing PDPH because of their restricted mobility and their sedentary lifestyles".

Moreover, ***Mowafy S., & Abd Ellatif E., (2021)*** found no significant difference between PDPH and the mean BMI in patients for whom a 27G Quincke spinal needle was used and also had very few patients with a BMI >40. Similarly, several retrospective cohort studies found that "PDPH incidence reduced with higher BMIs and explained that due to the increased intra-abdominal pressure which triggered pooling in the epidural veins, lowering CSF leakage by decreasing CSF volume in the lumbar neuroaxial canal" ***(Abotaleb et al.*, 2022*, Jonathon et al.*, 2022 & *Manuel et al.*, 2022)**.

This divergence between the current study's outcomes and those of other studies, could be the consequence of the fact that, "The amount of CSF leakage is considered to be the main factor for PDPH's development" **The International Headache Society, (2021)**. Besides, the present study depended on using the smallest gauge size of epidural anesthesia needles thus, allowed smaller amounts of CSF to leak and consequently decreased risk of PDPH's development in lower BMI studied patients.

With reference to distribution of patient's PDPH severity level in relation to post-spinal anesthesia days, the current study illustrated that in both study groups, the association between patients' PDPH severity level and post-spinal anesthesia days was found to be statistically significant for the first 24 hours post-spinal anesthesia. In addition, a strong significant correlation noted among patients of study group I (supine position group) during the next 48 hours and 72 hours post-spinal anesthesia in relation to their PDPH's severity level, while no significant correlation observed for patients of study group II in these days.

These results are in correspondence with **the International Headache Society's (2021)** definition of PDPH as "the occurrence of headache is typically within the first five days post dural injury". Similarly, ***Hermann et al., (2022)*** concurred the present study's findings and discovered that "The majority of postdural headache cases occurred in studied patients within the first three days postoperatively", while ***Zielman et al., (2016)*** disagreed with these findings and observed, "PDPH began one week later".

Furthermore, multiple previous studies corroborated the current study's findings, as

they revealed, "The bulk developments of PDPH in postdural anesthesia patients were occurred the third to fifth day later" ***(Abotaleb et al., 2022, Mathur et al., 2018, Weinrich et al., 2020, & Yan et al., 2020)***.

This congruence between the current study's outcomes and all those preceding studies, could be the consequence of **the International Headache Society (2021)**'s assertion that, "the occurrence of headache is typically within the first five days post dural injury".

Conclusion

Post-dural puncture headache is a complication that needs to be handled seriously because of its considerable morbidity and even mortality and although it could cured spontaneously but it may last for months or even years in some individuals. In conclusion, maintaining patients in supine position for the first 72 hours post spinal anesthesia as a management technique significantly improved their post-dural puncture headache's incidence, severity and associated complications.

Recommendations:

- Designing a plan of care for post-spinal anesthesia patients should include positioning as a simple management technique that could lead to preferable effects regarding their post-dural puncture headache's incidence, severity and associated complications.
- More awareness and education programs are required for surgical nursing staff about the important role of positioning following spinal anesthesia in reducing post-dural puncture headache's incidence, severity and associated complications.
- Health care providers should include positioning following spinal anesthesia in the patient's treatment regimen
- Replication of the current study on a larger sample size and for longer follow-up period to allow for results' generalization
- Further research on impact of positioning after spinal anesthesia on post-dural puncture headache is needed using a multidisciplinary approach to cover different surgical settings not only orthopedics' and urological surgeries.

CONFLICT OF INTEREST: there is no conflict exists

References

Abotaleb A., ElSharkawy M., & Almawardy H., (2022). Bilateral sphenopalatine ganglion block with adrenaline additive for post-dural puncture headache in orthopedic patients: A randomized controlled trial, Egyptian Journal of Anaesthesia, 10.1080/11101849.2022.2077051, 38, 1, (305-309).

Akdemir MS, Kaydu A, Yanlı Y, Özdemir M, & Gökçek E, (2021). The Postdural Puncture Headache and Back Pain: The Comparison of 26-gauge Atraucan and 26-gauge Quincke Spinal Needles in Obstetric Patients. Anesth Essays Res. ;11(2):458-462. [PMC free article] [PubMed]

Alexandre L., Kristi D., Xiang Y., & Josef C., (2022). Long-term complications of unintentional dural puncture during labor with epidural analgesia: a case–control study, Regional Anesthesia & Pain Medicine, 10.1136/rapm-2022-103266, 47, 6, 364-9.

Amin S, Javaid S., Olsen J, Bousser G, & Diener C. (2014). The International Classification of Headache Disorders: 2nd edition. Cephalalgia 249–160.

Bandatmakur M., Carter B., Ngum N., Osman H., Dave P., Ahmad F., & et al., (2021). Factors Predisposing to Post Dural Puncture Headache, Journal of Neurology, 10.1177/08830738211007699, 36, 10, (831-840).

Beckett, A., (2018). Are we doing enough to prevent patient injury caused by positioning for surgery?. *Journal of perioperative practice*, *20*(1), 26-29

Berman, A., Snyder, S. J., Levett-Jones, T., Hales, M., Harvey, N. & Stanley, D. (2018). Kozier and Erb's Fundamentals of Nursing, 4th Australian ed., p.p.817-32.

Cognat E, Koehl B, Lilamand M, Goutagny S, Belbachir A, de Charentenay L, & et al., (2021). Positions for Preventing Post-Lumbar Headache. Ann Emerg Med. 2021;78:443–50

Gaiser RR., (2021). Postdural Puncture Headache: An Evidence-Based Approach. Anesthesiol Clin. ;35(1):157-67. [PubMed]

Ghaleb A, Khorasani A, & Mangar D., (2019). Post-dural puncture headache Int J Gen Med.;5:45–51

Hermann B., Siegler Y., Beatrice O., Kranke P., Markus A., Weigand M. , (2022) Postdural puncture headache in obstetrics, Die Anaesthesiologie, 10.1007/s00101-022-01171-2, 71, 8, (646-660).

Jonathon M., Eric S., & Sangam K., (2022). Imaging of Headaches due to Intracranial Pressure Disorders, Neurologic Clinics, 10.1016/j.ncl.2022.02.006, 40, 3, (547-562)

Karaman H., Veličković I, Pujic B, & Baysinger CL., (2020). Continuous Spinal Anesthesia for Obstetric Anesthesia and Analgesia. Front Med (Lausanne). ;4:133. [PMC free article] [PubMed]

Kurnutala LN, Kim D, Sayeed H, & Sibai N., (2019). Persistent Spinal Headache After Removal of Intrathecal Drug Delivery System: A Case Report and Review of Literature. Anesth Pain Med. Oct;5(5):e29786. [PMC free article] [PubMed]

Manuel C., Vallejo T., Mark I., & Zakowski N., (2022). Post-dural puncture headache diagnosis and management, Best Practice & Research Clinical Anaesthesiology, 10.1016/j.bpa.2022.01.002, 36, 1, (179-189)

Mathur V, Zorrilla-Vaca A, & Grant MC., (2018). The Impact of Spinal Needle Selection on Postdural Puncture Headache: A Meta-Analysis and Metaregression of Randomized Studies. Reg Anesth Pain Med. ;43(5):502-508. [PubMed]

Miranda, A. B., Fogaça, A. R., Rizzetto, M., & Lopes, L. C. (2016). Surgical positioning: nursing care in the trans-operative period. Rev SOBECC, 21(1), 52-8. [**Link**]

Mohammad R.E, Maryam D,M, & Puran H. (2022) Effect of Position during Spinal Anesthesia on Postdural Puncture Headache: A Prospective, Single-Blind Randomized Clinical TrialAnesth Pain Med.; 6(4): e35486. doi: 10.5812/aapm.35486

Mowafy S., & Abd Ellatif E., (2021). Effectiveness of nebulized dexmedetomidine for treatment of post-dural puncture headache in parturients undergoing elective cesarean section under spinal anesthesia: a randomized controlled study, Journal of Anesthesia, 10.1007/s00540-021-02944-6, 35, 4, (515-524).

Nath S, Koziarz A, Badhiwala JH, Alhazzani W, Jaeschke R, Sharma S, & et al., (2018). Atraumatic versus conventional lumbar puncture needles: a systematic review and meta-analysis. Lancet. Mar 24;391(10126):1197-1204. [PubMed]

Park, C., Price, P., Frey, K., & Junge, T., (2020). *The effect of patient positioning on CSF pressure and loss in spinal surgery*. Anesthesia & Analgesia, 91*(3), 552-557.*

Plewa MC, & McAllister RK. (2022). StatPearls Publishing; Treasure Island (FL): Postdural Puncture Headache. [PubMed]

Robin M., Gerrit L., Pelzer N., Ronald J., Willibrordus P., Oosterhout, & et. al., (2021). The effect of needle size on cerebrospinal fluid collection time and post-dural puncture headache: A retrospective cohort study, Headache: The Journal of Head and Face Pain, 10.1111/head.14046, 61, 2, (329-334).

Rosdahl, C. B., & Kowalski, M. T., (2018). Textbook of basic nursing. *Lippincott Williams & Wilkins. 7th.ed.,p.p.(714-19).*

Sayed G, Stanhope E, Foulds L, & Goldmann U., (2019). Diagnosing causes of headache within the postpartum period. J Obstet Gynaecol. ;38(5):728. [PubMed]

Statistical records of Menoufia University Hospital's surgery departments of urology and Orthopedic, Menoufia Governorate, Egypt, (2022).

The International Headache Society (2021), Incidence and prevalence estimates on Occurrence of Tension Headache among Surgical Patients Undergoing Spinal Anesthesia. J Anesth Clin Res 3:223. doi:10.4172/2155-6148.1000223 [PubMed]

Tubben RE., Jain S., & Murphy PB., (2021). StatPearls Publishing; Treasure Island (FL): Epidural Blood Patch. [PubMed]

Turnbull D K and Shepherd D B., (2004). Post-dural puncture headache: pathogenesis, prevention and treatment. Br J Anaesth,9:1718–729.

Uchino K., (2018): A traumatic lumbar puncture needles reduce postdural puncture headache compared with conventional needles. Ann Intern Med. ;168(6):JC34. [PubMed]

Warden V, Hurley AC, & Volicer L., (2003). Development and evaluation of the pain assessment in Numerical visual Analogue scale. Journal of the American Medical Directors Association; 4:9-15.

Weinrich C., Henkelmann A., Balzer F., Obbarius P., Ritschl, V., Niggemann L.& et al., (2020). Postdural puncture headache after neuraxial anesthesia: incidence and risk factors, Der Anaesthesist, 10.1007/s00101-020-00846-y, 69, 12, (878-885)

Williams J., Lye D., & Umapathi T. (2018). Diagnostic lumbar puncture: minimizing complications. Intern Med J ; 38:587–91.doi:10.1111/j.1445-5994.2018.01631. CrossRefPubMedGoogle Scholar

Yan H., Salzer J, Rajda C, Sundström P, Vågberg M, & Vécsei L, (2020). How to minimize the risk for headache? A lumbar puncture practice questionnaire study. Ideggyogy Sz. ;69(11-12):397-402. [PubMed]

Zajac D., (2021). Nursing Issues in the Diagnosis and Treatment of Headaches. In: Tepper, S.J., Tepper, D.E. (eds) The Cleveland Clinic Manual of Headache Therapy. Springer, New York, NY. https://doi.org/10.1007/978-1-4614-0179-7_19

Zielman N., Alexander C., Michel D., Jayawarna L., and Jude E., (2016) Post-lumbar puncture headache: diagnosis and management, Postgrad Med J. Nov; 82(973): 713–716.