



An Investigation of the Relationship between Anthropometry (Height, Weight and Body Mass Index) and Incidence of Low Back Pain Following Spinal Anesthesia in Elective and Emergency Surgical Procedures

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ABSTRACT

Background: The incidence of low back pain in adults after spinal anesthesia is rather similar to that of general anesthesia. The pain is often mild with an increased incidence of low back pain that rarely spreads to the lower extremities but persists for several days after surgery. Fear of complications of back pain after neuraxial injection is one the main reason for patient's refusal of neuraxial anesthesia. Some studies reported obesity and BMI above 32 as risk factors for low back pain after surgery.

In this study, we aimed to investigate the relationship between selected parameters of body composition, including the amount of total body fat and muscular tissue, and the incidence of low back pain after spinal anesthesia.

Methods: A cross-sectional study was carried out on 100 patients who were candidates for elective or emergency surgery under spinal anesthesia. At first demographic data, a history of back pain and assessment and anthropometric assessment was asked. The history of back pain and intensity of pain were asked after one day, one month and 4 months after surgery. Then the relationship between pain intensity and anthropometric data were assessed.

Results: The mean pain intensity in the normal weight group was 1.3 ± 0.63 . In the overweight group, the mean pain intensity was 1.1 ± 0.41 . In the obese group, the mean pain intensity was 2.2 ± 1.2 .

Regarding the relationship between mean pain intensity and weight, BMI, and anthropometry, the incidence of pain was not related to patients' anthropometry; the mean pain intensity of these groups were compared; and the incidence of pain was not dependent on weight, BMI, and anthropometry (p -value= 0.4).

Conclusion: Based on the obtained results, it can be concluded that no correlation exists between the incidence of low back pain and mean severity of pain and anthropometric indicators such as BMI, however, low back pain lasted longer in obese patients, which requires further study to investigate the exact nature of such a relationship.

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Low back pain is a common health problem that has significant effects on patients' physical activity, psychological wellbeing, and financial resources. Moreover, low back pain is one of the most common complaints that causes patients to visit primary care providers. It is estimated that 9 out of 10 individuals experience low back pain during their lifetime [1].

Since the 1950s, studying prevalence and mechanism of back pain after neuraxial anesthesia, attracted attention of anesthesiologists. Fear of complications of back pain after neuraxial injection is one the main reason for patient's refusal of neuraxial anesthesia [2-3].

The incidence of low back pain in adults after spinal anesthesia is rather similar to that of general anesthesia. The pain is often mild with an increased incidence of low back pain that rarely spreads to the lower extremities but persists for several days [2,4].

Risk factors for low back pain during surgery include lithotomy position, repeated attempts to induce anesthesia, surgical procedures longer than 2.5 hours, a BMI of above 32, and a history of low back pain. The onset of low back pain can be attributed to a ruptured ligament or fascia, bone injury at the distal injection site, and local bleeding [2-3,5].

Other risk factors include spinal immobilization, relaxation of the paravertebral muscles due to anesthesia, loss of normal curvature of the spine as a complication of the surgery, sprain in the ligaments, and joint capsules of the vertebral column [2].

Other causes of low back pain after surgery include 1- Surgical positioning 2- Worsening medical condition of patients 3- Trauma caused by the placement of the spinal or epidural needle following the central neuraxial blockade 4- In rare cases, epidural abscess of the spinal column 5- Hematoma following the central neuraxial blockade [2-3,6].

A large number of patients complain of low back pain following anesthesia. While the prevalence of low back pain is around 46% following general anesthesia and most patients undergoing spinal anesthesia attribute their low back pain to this type of anesthesia, it can be argued that the placement of the spinal or epidural needle is the primary cause of low back pain in these patients. Consequently, it was revealed in a study that 13.14% of patients were reluctant to undergo spinal anesthesia due to pain-related fears of low back pain [2].

Symptoms can range from tingling to radicular pain in the upper or lower extremities, buttocks, and front of the lower legs.

Moreover, 29.6% of 100 patients in a study had complaints of low back pain within a week after surgery, which was different from classic low back pains they had experienced before. Mediating factors in the onset of low back pain following spinal anesthesia may include 1- The duration of surgical procedure 2- Surgical positioning.

The pain usually lasts between 3-7 days in surgeries with short operation time; however, it can last up to 3 months in a limited number of cases. It can be argued that low back pain following spinal anesthesia is the result of using an improper technique rather than due to severe complications of surgery such as epidural abscess, hematoma, and meningitis. Obesity is a major concern in virtually all demographic groups around the world, affecting about 500 million individuals. Moreover, obesity is highly associated with musculoskeletal diseases, including low back pain. It has been specifically shown in a number of studies that the higher the BMI, the higher the incidence rate of low back pain. Since obesity is associated with increased systemic inflammation, it can alter the response of proinflammatory cytokines in the body. Consequently, these proinflammatory cytokines, including CRP, TNF- α , amyloid-A, interleukin-6, and WBCs may trigger pathological pain which, in turn, causes multiple musculoskeletal diseases such as chronic low back pain [5].

In this study, we aimed to investigate the relationship between selected parameters of body composition, including the amount of weight and BMI, and the incidence of low back pain after spinal anesthesia.

Based on extensive research on various scientific sources and to the best knowledge of the authors, a study has yet to be published that investigates the relationship between the body composition and incidence of low back pain after spinal anesthesia. Thus, we aimed to carry out such a study in an Iranian population.

The primary aims of the authors were to determine the relationship between weight, height, waist circumference, gender, and BMI and the incidence of low back pain after spinal anesthesia in patients referred to the anesthesia department of Sina Hospital in 2018.

Methods

A cross-sectional study was carried out on 100 patients who were candidates for elective or emergency surgery. The patients were all optimal candidates for spinal anesthesia. The demographic information of patients, age, gender, a history of low back pain, current low back pain, a history of a back injury, a history of pelvic injury, a history of undergoing surgery, a history of undergoing anesthesia in previous surgeries, type of recent surgery, level of education, number of children was obtained prior to anesthesia.

Patients were then asked to provide information regarding their medication history, including previous medications used before surgery and current medications being used in their treatment. Moreover, participants' height was measured using a height measure tape with an accuracy of 1 mm, their weight was measured using a SECA weighing scale with an accuracy of 0.1 g, their waist circumference was measured at the narrowest point

and umbilical level, and their hip circumference was measured at the widest part of the buttock.

Patients are then followed-up one and three months after surgery in order to be examined for the onset of low

back pain, worsened low back pain, and the degree of disability caused by spinal anesthesia.

Pain severity was measured using the Visual Analogue Scale (VAS).

Absence of pain 0 1 2 3 4 5 6 7 8 9 10 Worst pain experienced

Low back pain was defined as any sensation of pain in the posterior part of the body below the costal margin and above the inferior gluteal folds, with or without sciatica. Subsequently, the relationships between the incidence or severity of low back pain and participants' type of surgery, weight, height, and BMI were evaluated.

Statistical analyses

For the quantitative variables, the mean and standard deviation (SD), and for the qualitative variables, frequency and percentage were used. ANOVA analysis was used to compare the mean pain intensity in the BMI groups. The analyses were performed using SPSS software at an error level of 5%.

Results

A hundred patients entered the study, 89% of whom were male and 11% female. The minimum age of patients was 14, and the maximum age was 80, with an average of 40.4 ± 15.63. (Table 1-2) shows the weight, age, and VAS BMI of the patients. Eighty-two percent of the

patients did not have pain, with a VAS ranging from 2 to 6.

Regarding the surgery type, most surgeries were orthopedics and lower limb fractures. Concerning the weight and BMI, 49 patients had a normal weight, 40 were overweight, and 11 were obese; the information and the relationship between weight and back pain severity are shown in (Table 3).

The mean pain intensity in the normal weight group was 1.3 ± 0.63. In the overweight group, the mean pain intensity was 1.1 ± 0.41. In the obese group, the mean pain intensity was 2.2 ± 1.2. The ANOVA test was used for pain intensity within each group and between the groups, but there was no significant difference between them (p-value = 0.19) (Table 4-6)

Eighty-two percent of the patients did not have pain at the end of the 30th day post surgery and 18% had pain; the VAS of the patients are depicted above (Table 5).

Regarding the relationship between mean pain intensity and weight, BMI, and anthropometry, the incidence of pain was not related to patients' anthropometry; the mean pain intensity of these groups were compared; and the incidence of pain was not dependent on weight, BMI, and anthropometry (p-value = 0.4).

Table 1- Basic information of the patients.

	Descriptive Statistics				
	N	Minimum	Maximum	Mean	Std. Deviation
Age	100	14.00	80.00	40.4500	15.63108
Weight	100	37.00	140.00	75.8700	15.09676
BMI	100	14.00	46.00	24.9360	4.76425
Waist	100	60.00	130.00	93.2700	12.69920
Hip circumference	100	36.00	87.00	51.6200	6.78349
VAS	100	0.00	6.00	0.6200	1.38374

Table 2- VAS of the patients one day after the surgery and spinal anesthesia

VAS	Frequency	Percent	Cumulative Percent
0.00	71.0	71.0	71.0
2.00	10.0	10.0	81.0
3.00	10.0	10.0	91.0
4.00	8.0	8.0	99.0
6.00	1.0	1.0	100
TOTAL	100.0	100.0	

Table 3- The weight of the patients and its relationship with back pain severity

weight	N	Mean	Std. Deviation	Std. Error	VAS 95% Confidence Interval for Mean			
					Lower Bound	Upper Bound	Minimum	Maximum
Normal	49	0.6327	1.30214	0.18602	0.2586	1.0067	0.00	4.00
Over Weight	40	0.4250	1.15220	0.18218	0.0565	0.7935	0.00	4.00
Obese	11	1.2727	2.24013	0.67542	-0.2322	2.7777	0.00	6.00
Total	100	0.6200	1.38374	0.13837	0.3454	0.8946	0.00	6.00

Table 4- The back pain severity frequency in the normal, overweight, and obese groups.

BMI CATEGORY	backpain		
	yes	no	total
Normal	10	39	49
Overweight	5	35	40
Obese	3	8	11
Total	18	82	100

Table 5- VAS of the patients 30 days after the surgery and spinal anesthesia

	frequency	Percent	Vas	
			Valid Percent	Cumulative Percent
Valid	0.00	82	82	82.0
	2.00	2	2	84.0
	3.00	8	8	92.0
	4.00	7	7	99.0
	6.00	1	1	100.0
total	100	100	100.0	

Table 6- The results of VAS at the end of the 4th month showed a downward trend.

	frequency	Percent	Vas	
			Valid Percent	Cumulative Percent
Valid	0.00	92	92	92.0
	2.00	2	2	94.0
	3.00	3	3	97.0
	4.00	2	2	99.0
	6.00	1	1	100.0
total	100	100	100.0	

Discussion

In a randomized clinical trial by Rom A. Stevens et al. in 1993, a hundred patients aging 18-65, who were candidates for knee surgery, were divided into five groups; the first group received epidural anesthesia with a 30-cc bolus of lidocaine 2%, the second group received

15cc chloroprocaine 3%, and the third group received 30 cc chloroprocaine 3%, which was repeated every 45 minutes. The fourth group received 30 chloroprocaine 3%, which was repeated every 45 minutes. The fifth group received 30 cc chloroprocaine 3% with a pH of 7.3, which was added by CC10 at 45th min. After the anesthesia and before the repetition of each drug, the patients were asked for knee pain and low back pain

according to the VAS (Visual Analog Scale) scale; moreover, they were given a telephone interview 24 hours after surgery for low back pain. Finally, they concluded that a chloroprocaine dose higher than 40 ccs containing EDTA, could lead to more severe back pain. Using 25 ccs or lower amounts of the solution can cause less pain than lidocaine [3].

A cross-sectional study in 2010 examined the relationship between BMI and the prevalence of low back pain. In the study, 30102 men and 33866 women were studied. The BMI and low back pain data of these patients were evaluated. A total of 6293 men (20.9%) and 8923 women (26.3%) experienced chronic low back pain in the study. In both sexes, a high BMI was significantly associated with an increased prevalence of low back pain. Finally, they concluded that obesity is associated with a high prevalence of low back pain and it is essential to prove the cause-and-effect relationship in this case [7].

In a study by Dr. NoorMohammadpour et al. on 22952 individuals in 2016, aimed at evaluating the biological and cytological factors contributed to the prevalence of low back pain in the urban population of Tehran, a high BMI was reported as one of the factors associated with low back pain [8].

In another study, by Schwabe et al. in 2001, the incidence of low back pain after non-pregnancy spinal anesthesia and the interfering factors were examined in a one-year follow-up on 245 patients, who underwent electrosurgery following a trauma. All the patients received the initial questionnaire three months after anesthesia, reporting the incidence of low back pain, and completed the second questionnaire one year after anesthesia [9].

The response rate of patients to the questionnaires was 56%. Twenty-four of the 123 respondents (18.9%) complained of low back pain before anesthesia, while twelve of the 122 patients (10.7%) had low back pain 50 days after anesthesia. After three months, fifteen of the 122 patients (12.3%) reported low back pain, fourteen of whom had low back pain before undergoing the spinal anesthesia. In the present study, patients did not have a history of technical factors associated with low back pain. Nine of the fifteen patients who still had low back pain after three months completed the second questionnaire after one year; four of them still had low back pain, three of whom had pain before anesthesia. Despite having low back pain after three months, thirteen patients out of the fifteen still tended to have spinal anesthesia in the presence of back pain [9].

In a study by Yuan-Yi Chia et al. in 2016, the risk of developing chronic low back pain was evaluated in patients undergoing a neuraxial anesthesia cesarean. Of the 61027 patients, 8662 underwent spinal anesthesia cesarean section, and 4298 underwent epidural anesthesia cesarean section. Women who underwent epidural anesthesia had a higher risk of low back pain than those

who underwent vaginal delivery. The authors concluded that an epidural anesthesia cesarean section might increase the risk of chronic low back pain [6].

In another study by Urquhart et al. in 2011, the relationship between the presence of a fat mass and the severity of low back pain and the resultant disability was examined. The study examined 135 people aging 25-62 with a BMI between 18-55 to assess the relationship between obesity and musculoskeletal disorders, including low back pain. In this study, a high BMI was associated with a more severe low back pain and resultant disabilities. Higher pain intensity was significantly associated with higher body fat levels, especially lower body fat, while it was unrelated to the lean body mass. In this study, no association was found between lean body mass and the and the severity of low back pain and resultant disabilities [10]

In a study by Toda et al. in 2000, the lean body mass and fat distribution in patients with chronic low back pain was studied. In this study, 330 people between 45 and 69 who complained of low back pain were examined for more than three months. Anthropometry, including BMI, lean body mass percentage, waist-to-hip ratio, and fat percentage of each limb, was evaluated and compared with the control group. The authors concluded that the absence of muscle mass in the trunk and lower limbs, and central obesity could be a risk factor for chronic low back pain even without a positive SLR test [11].

In another study by Han et al. in 1997, the prevalence of low back pain and its association with body fat distribution was investigated. The authors concluded that overweight women and those with high waist circumference had a significant increase in low back pain. The study did not show a significant relationship between height, waist-to-hip ratio, and BMI with low back pain symptoms [12].

In a study by Tekgül et al. in 2015, it was shown that, contrary to popular belief, the number of lumbar punctures, methods, the position of spinal anesthesia, age, sex, surgical location, and type of surgery were not associated with the acute back pain following spinal anesthesia. A history of back pain was the only common risk factor in patients complaining from low back pain for four weeks and one day post-surgery. Also, the univariate analysis of the variables showed that the presence of low back pain four weeks after surgery had a significant relationship with body mass index, back pain history, and surgery duration. However, such a significant relationship was not observed in multivariate analysis, and the only significant variable was preoperative low back pain. In this study, only 5.2% of people had low back pain four weeks after surgery, of whom 88.2% had a history of low back pain before surgery [13].

In another study by Kock et al. in 1998, aimed at evaluating the long-term incidence of back pain after the induction of spinal anesthesia using a catheter in the

lumbar region, the long-term incidence of low back pain was reported to be 11.5%; the incidence was mainly associated with pre-surgical low back pain, while biometric factors did not have a role in the development of low back pain after the surgery [14].

A study by Schwabe and Hopf showed that the development of low back pain after spinal anesthesia was not associated with the patient's characteristics or the technical factors. They also reported that three months after the surgery, new low back pain was observed in only 0.8% of the patients (1 in 122 patients), showing that postoperative low back pain was associated with a history of pre-surgical low back pain [9].

Moreover, a study by Brown and Elman in 1961, showed that the risk of low back pain after spinal anesthesia was 6.9%, compared with 7.8% in patients who underwent general anesthesia. They also concluded that the type of anesthesia and the location of the surgery were not associated with low back pain after surgery, and the only contributing factor was the duration of bed rest [15].

Dahl et al., in a study on 100 patients aging 18-49, who underwent elective arthroscopy of the knee joint, reported that dural spinal anesthesia caused a more severe low back pain compared with the general anesthesia, which contradicts the results of the present study. In this study, low back pain was the most common complaint after the spinal anesthesia (2-25%); however, the duration of pain was short and did not interfere with normal activities [16].

Conclusion

Based on the obtained results, it can be concluded that no correlation exists between the incidence of low back pain and mean severity of pain and anthropometric indicators such as BMI, however, low back pain lasted longer in obese patients, which requires further study to investigate the exact nature of such a relationship.

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