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A PROSPECTIVE COMPARATIVE STUDY OF THE IMPACT OF BODY MASS INDEX ON THE INCIDENCE OF POST-DURAL PUNCTURE HEADACHE IN PARTURIENTS UNDERGOING ELECTIVE CESAREAN SECTION UNDER SPINAL ANESTHESIA: KAKATIYA MEDICAL COLLEGE, WARANGAL

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Abstract

The relationship between Post-Dural puncture headache (PDPH) and body mass index (BMI) in individuals who have just given birth has been the subject of contentious studies in the past. As a result, we decided to survey this complication in a group of patients who had cesarean sections performed under spinal anesthesia. It was predicted that people with greater BMIs would experience PDPH less frequently.The demographic data was retrieved and documented after looking over the patient files and phoning the patients. Additionally, a headache score based on a 0–10 verbal numeric rating scale (NRS) and the development of PDPH up to three days after a cesarean section in the present delivery were documented.At the Kakatiya Medical College in Warangal, 76 women who had undergone spinal anesthesia for a cesarean section participated in this study (March 2021 to February 2022). The subjects ranged in age from 20 to 40 years old (28.24 ± 3.27). The average BMI (kg/m2) before a cesarean section was 30.21 ± 2.82. 38 (50%) of the 76 parturient patients were not obese, and the remaining (50%) were (BMI > 30 kg/m2); 97.90% were non-smokers, and 92 percent had no prior history of PDPH during the previous neuro-axial anesthesia/analgesia. Only 13 participants (17.10 %) in this study experienced headaches following the current spinal

anesthetic. 31 patients (81.57%) and 32 patients (84.21%) of the patients who did not develop PDPH had BMIs below 30 and over 30 respectively (P = 0.386). We concluded that increased BMI at the time of cesarean section decreased the incidence of PDPH. Increased BMI lowers the risk of PDPH because obese patients' increased intra-abdominal pressure reduces CSF leakage from the dural puncture point. Additionally, this study demonstrated that neither BMI nor weight gain during pregnancy, nor any other characteristics looked at, had a significant impact on the severity of PDPH.

Keywords: Headache, Spinal anesthesia, Cesarean section, Body mass index.

Introduction

Spinal anesthesia is still the best option for cesarean sections (C/S) due to the greater danger of general anesthesia and its higher death rate. One of the most common side effects of this sedation approach is post-dural puncture headache (PDPH), which affects roughly 25% of patients during this anesthetic operation[1]. In a case-control study, Webb et al. found that 28% of pregnant women who had an unintentional dural puncture using a Touhy-needle gauge 17 experienced recurrent headaches. These women also experienced back pain[2]. One of the reasons for maternity issues can be PDPH. Medical therapy of this side effect can raise the expense of health care and length of hospital stay in addition to interfering with the mother's capacity to care for the infant[3]. Contradictory theories exist about the impact of body mass index (BMI) on the prevalence of PDPH. The common wisdom regarding the relationship between body mass index and post-dural puncture headache is supported by some research; a lower BMI is a risk factor for PDPH[4, 5]. In contrast, some other researchers do not believe in this idea. In neuro-axial anesthesia, changes in epidural/ interstitial spaces of obese patients may be the cause of less PDPH in these patients[6, 7]. There is some evidence about the higher epidural pressure in the obese patients compared to the lean ones, which could cause less leakage of cerebrospinal fluid (CSF) through the dura-membrane and so less PDPH[8]. On the other hand, according to some results, patients with BMI $\geq$ 30 kg/m^2 need less epidural analgesia dose rather than those with BMI<30 kg/m^2 which could be justified by the higher CSF-pressure [9]. In Choiet al.[10] study, the incidence of PDPH in patients with BMI<30 kg/m^2 was 45% and in those with BMI $\geq$ 30 kg/m^2 it was reported at 24% ($p<0.05$) [10], some other studies have confirmed this finding.

According to a study by Birajdar et al.[11] on the incidence of PDPH in women undergoing spinal anesthesia for cesarean sections, women with BMIs greater than or equal to 30 kg/m2 were less likely to develop the condition[12]. Miuet al.[13] compared headache frequency and intensity. No discernible differences between pregnant women with BMIs below or above 30 kg/m2 were discovered. A more recent study by Song et al. investigated and compared the effects of higher BMI on the reduction in the risk of PDPH in pregnant individuals who were not obese. They didn't detect any significant, separate findings [14]. To determine if a greater BMI acts as a preventative factor, we chose to examine the prevalence and severity of positional headache in pregnant patients who had spinal anesthetic for cesarean delivery. According to our theory, people with greater BMIs have a decreased incidence of PDPH.

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Materials and Methods

This study is a hospital-based comparative study and was approved by Ethical Committee ofKakatiya Medical College, Warangal. Duration of study march 2021 to February 2022. Written informed consent was obtained from the parents who accepted to participate in this study. In this study, we studied the files of elective cesarean section candidates.

Ages 20 to 40 years old, ASA classes I and II, first-time spinal anesthesia utilizing 25-G Quincke needles (Becton Dickinson, Spain), and intrathecal 0.5 percent bupivacaine without preservative substance for spinal anesthesia, and elective cesarean/section were the inclusion criteria. Before surgery, an anesthesiologist evaluated each patient and took note of their headache history.

Twin or multiple pregnancies, gestational diabetes, pre-or eclampsia, H/O migraine or any other types of headache, psychiatric illnesses, and switching from local anesthetic to general anesthesia before surgery were all ruled out.

Sample size:

76 respondents were found to satisfy the inclusion and exclusion criteria and to be available and cooperative to complete the questionnaire after reviewing the data of 148 cases of cesarean/section. Age, gravid number, history of smoking, height, last pre-pregnancy weight, weight gain during pregnancy, pre-cesarean weight, BMI, history of PDPH in previous neuraxial technique, having PDPH up to three days after delivery in a current spinal method of anesthesia, start date of PDPH, headache score based on 0–10 verbal numeric rating scale (NRS), and need for treatment with epidural were all taken from them and recorded in a checklist. To validate the early and secondary data, a sensitivity analysis was conducted with a cut-off value of 30 kg/m^2, which is accepted as the threshold value defining obesity by the World Health Organization (WHO).

In parallel, patients were divided into 2 groups: based on adult obesity and BMI, calculated in the database using their weight at the time of the procedure: Group 1: Nonobese.Patients (BMI<30 kg/m^2, Group<30); Group 2: Obese patients (BMI ≥ 30 kg/m^2, Group ≥ 30).

Formula: $n = z\alpha^2 \text{ X } pq / d^2$

Where n is the required sample size.

Z α is the standard normal deviate, which is equal to 1.96 at 95% confidence interval.

p is the prevalence in the population of the factor under study.

q = 100-p

d = Absolute precision is taken as 5% p = 2.5% q = 97.5%

n = number of samples is to be studied

Furthermore, the severity of PDPH was assessed using a visual analog scale (VAS) extending from 0-10; 0=no headache, 1-3=mild headache, 4-7=moderate headache, >7=severe headache. The primary outcome of this study was the presence of PDPH.

Secondary outcomes included the association of the incidence and severity of PDPH with the height, smoking, and weight gain during pregnancy, the last weight before pregnancy, and the last weight and BMI before cesarean section. In fact, in this study, the BMI differentiation of patients as obese and lean was determined, and in the next stage, the incidence of PDPH in these patients was examined.

Statistical analysis

SPSS, version 22, was used for all statistical analysis (SPSS Inc., Chicago, IL, USA). Results for the BMI groups were described using descriptive statistics, and between-group comparisons were made using chi-square or Fisher exact tests. Additionally, the incidence and severity of PDPH were compared to BMI and other potentially influential factors using the Mann-Whitney test and Spearman correlation test. Statistical significance was defined as a p-value of 0.05.

Results

This study was performed on 76 women who had undergone cesarean section under spinal anesthesia in Kakatiya Medical College, Warangal (March 2021 to February 2022). The age of the subjects was between 20 years and 40 years old (28.24 ± 3.27). The mean of BMI before cesarean/section (kg/m^2) 30.21 ± 2.82. The demographic distribution of parturient patients shows in table-1.

Table 1: The demographic distribution of parturient patients

Variable	Mean±SD
Age (years)	28.24 ± 3.27
Weight (kg)	68.23 ± 5.89
Height (cm)	149.45 ± 7.25
BMI before cesarean/section (kg/m^2)	30.21 ± 2.82
Duration of operation (min)	36.45 ± 4.89

Data are presented as mean±standard deviations (SD)

The parturient patients were between gravid 1-8:24(31.58%)gravid 1, 31 (40.79%) gravid 2, 7 (9.21%) gravid 3, 5(6.58%) gravid 4, 4 (5.26%) gravid 5, 2 (2.63%) gravid 6, 2 (2.63%) gravid 7 and 1 (1.31%) gravid 8.

38 (50%) of the 76 parturient individuals were not obese, and the remaining (50%) were (BMI > 30 kg/m2); 97.90% were non-smokers, and 92 percent had no prior history of PDPH during the previous neuro-axial anesthesia/analgesia. Only 13 participants (17.10 percent) in this study experienced headaches following the current spinal anesthetic.

Of the patients who did not develop PDPH, 31 (81.57%) had a BMI <30 and 32 (84.21%) had a BMI ≥30 (P = 0.386), Results shows in table-2

Table 2: Table 2: PDPH distribution according to BMI

Variable		Incidence of post-spinalHeadache (%)		p-value
		Group-I (n=38)	Group-II (n=38)	
History of PDPH	Yes	7(18.42 %)	6 (15.79 %)	**0.386**
	No	31 (81.57 %)	32 (84.21 %)	

Group I: BMI<30, Group II: BMI≥30; PDPH: post-dural puncture headache

The incidence of post-dural puncture headache and pre-cesarean weight, as well as the amount of weight gained throughout pregnancy, were significantly correlated, as shown in Table 3 (p-values: 0.008 and <0.001, respectively). In other words, the incidence of headaches will decrease as weight gain from pregnancies and caesareans increases.

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Table 3: The relation of pre-cesarean weight (kg) and weight gain during pregnancy (kg) with the incidence of post-spinal headache

Variable	Incidence of post-spinalHeadache [mean ± std deviation]		p-value
	Yes	No	
Pre-cesarean Weight (kg)	77.56 ± 9.58	73.27 ± 5.78	0.008
Weight gain duringpregnancy (kg)	13.24 ± 2.32	11.21 ± 2.58	<0.001

Discussion

Although the NRS in pregnant women with different BMI levels did not significantly differ, the current investigation showed that patients with BMIs more than 30 experienced the majority of headache instances.

For cesarean surgeries, regional anesthesia is secure. One of the most frequent side effects of spinal anesthesia is PDPH. CSF leaking, a drop in intracranial pressure, and stress on the meningeal arteries and nerves are all caused by the hole the spinal needle makes in the dura mater, and these factors are thought to cause PDPH. Although it occurs more frequently in obstetric situations, PDPH is present in spinal anesthesia at a rate of 0.2–24%. [15] In obstetric situations, PDPH is linked to changes in blood and fluid quantities, as well as intra-abdominal pressure during and after delivery [16].

The age of the subjects was between 20 years and 40 years old (28.24 ± 3.27). The mean of BMI before cesarean/section (kg/m^2) 30.21 ± 2.82. In parallel, there are several similarities between our study population and other studies that showed a lower incidence of PDPH[17, 18] which may account for our findings to find an effect of BMI on the outcome. These include similarities in BMI demographics and dural puncture with the same needles. Previous studies [19] noted lower rates ofPDPH, as BMI increased, was conducted after spinal anesthesia. But, in contrast to these findings, astudy by Miu et al.[13] which assessed the association between body mass index and PDPH in patients with cesarean section did not show that patients with high body mass index were less likely to have PDPH, 6 while our study, unlike that ofMiu et al.[13], confirmed this idea. In addition, our findings on the relationship of BMI with PDPH after dural puncture are consistent with the findings of Peralta et al., which reported that the relationship between BMI and PDPH in women with cesarean section by spinal method, showing that the prevalence of PDPH in patients with higher BMI was reduced[20, 21]. The results of this study confirm our findings.

Our study also demonstrated that there was no correlation between patient age, gravid number, height, and weight prior to pregnancy, weight gain during pregnancy, pre-cesarean weight, and BMI for the severity of headache following spinal anesthesia (using a numerical rating scale in cases of headache related to dural puncture). Additionally, post-spinal headache severity was not noticeably worse in patients with a history of PDPH compared to the other patients (p-value: 0.386).

According to the results of the present study, it is suggested that the spinal technique should be used as the anesthesia method in lean pregnant women (BMI less than 30 kg/m^2) with more precautions because these people are considered to be at higher risk of PDPH. It appears that the increase in BMI causes higher intraabdominal pressure, which reduces CSF leaking from the dura hole at the site of needle entry, and is the presumed source of the

decrease in PDPH rate in obese patients. Parallel to this, Hogan et al. hypothesized that intraabdominal pressure rises linearly with body weight and discovered that external abdominal compression reduces CSF volume, which could imitate a static rise in abdominal pressure like that experienced during pregnancy[22, 23]. Furthermore, according to the same researchers, the method entails "inward displacement of soft tissue in the intervertebral foramen." The volume of CSF in the lumbar neuraxial canal decreases as a result of increased abdominal pressure in the obese parturient, which may potentially worsen pregnancy-induced epidural venous engorgement[24]. With a great degree of assurance, and BMI. Therefore, a non-pregnant population who has been prescribed spinal anesthetic might make for a better comparison.

Conclusion

Taken together, our data support the hypothesis that a high BMI is associated with a lower risk of developing a PDPH, and there was no statistical association between the patients' characteristics, such as height, weight, and BMI. Although subjects with high BMI had a lower incidence of PDPHs, body weight had no bearing on the condition's severity or whether it required treatment. It is advised that more research be done using bigger sample sizes to determine the factors that have the greatest impact on the severity of post-spinal headaches.

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