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ORIGINAL ARTICLE

Comparison of Prevalence of Shivering after Spinal Anaesthesia in patients undergoing Cesarean Section in Winter and Summer

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ABSTRACT

Background: Postoperative shivering is a common problem associated with spinal anesthesia. Shivering is usually triggered by hypothermia. This is by far the standard approach of anaesthesia for elective and emergency caesarean sections. Hypotension is the predominant complication during caesarean sections, linked to maternal nausea and vomiting, as well as the potential for fetal and neonatal acidosis. This study is being conducted as a part of quality improvement measure.

Objective: To find the frequency of shivering after spinal anaesthesia in patients undergoing cesarean section in winter

Study design: Descriptive case series

Place and duration of study: Department of Anaesthesia, Jinnah Hospital, Lahore from 1st January 2022 to 30th June 2022.

Methodology: There were two hundred patients registered. After undergoing spinal anesthesia, the patients were placed in the supine position, given 4 L/min of oxygen via a face mask, covered with surgical drapes without being actively warmed, and monitored using non-invasive arterial blood pressure measurements every five minutes, pulse oximetry, ECG (lead II and V with ST segment analysis), and core temperature monitoring. Patients were evaluated by an anesthesiologist for core temperature before and immediately after the intrathecal injection. Patients were followed were followed for 15 min after spinal anesthesia and shivering was recorded. Administration of spinal anesthesia and collection of data in the operation theater regarding the grade of shivering and efficacy of the drug was done by an anesthetist having 5 years of experience.

Results: The average age was 26.33±7.47 years and the mean body mass index was 24.79±2.95 kg/m^2. The shivering was found in 107(53.50%) patients.

Conclusion: The frequency of shivering is 53.50% after spinal anaesthesia in patients undergoing cesarean section in winter.

Keywords: Spinal anaesthesia, Cesarean section, Shivering.

INTRODUCTION

Postoperative shivering frequently occurs following spinal anaesthesia. Shivering is a primary source of discomfort for postoperative patients. The autonomic nervous system regulates core body temperature within the range of 36.5-37.5°C by a series of physiological and behavioural adjustments. Shivering is typically induced by hypothermia. Nonetheless, it transpires even in normothermic individuals throughout the perioperative phase. Anaesthesia induces a phase-like reduction in core temperatures.[1]

The aetiology of shivering is not adequately understood. Although cold-induced thermoregulatory shivering is a clear aetiology, the phenomena have also been ascribed to various additional factors, such as discomfort, disinhibited spinal reflexes, diminished sympathetic activity, and respiratory alkalosis. The standard rationale for post-anaesthetic tremor is that the inhibition of thermoregulation generated by anaesthesia suddenly ceases, hence elevating the shivering threshold towards normalcy. The inconsistency between the consistently low body temperature and the current near-normal threshold triggers basic thermoregulatory shivering. Challenges with this proposed explanation include the observations that tremors are occasionally absent in significantly hypothermic individuals and, conversely, present in normothermic patients.[2]

Postoperative shivering is a prevalent consequence following spinal anaesthesia. Hypothermia during spinal anaesthesia is believed to result from the shift of heat from the core to peripheral areas, the loss of vasoconstriction below the block level leading to increased heat loss from body surfaces, and altered thermoregulation characterised by a reduction in shivering thresholds.[3-8] The occurrence of postoperative shivering in patients receiving spinal anaesthesia ranges from 40% to 56.7%. A significant spinal block is recognised to reduce core temperature, with a decrease of 0.15°C for each dermatome elevation in block level.[8]

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While shivering may confer advantageous thermoregulatory effects, it subjects the organism to heightened physiological stress. Shivering is a prevalent and distressing consequence of spinal anaesthesia, resulting in discomfort and dissatisfaction among parturients following caesarean sections. This study aims to evaluate an association of shivering with weather changes in our institution situated in Lahore which has a semi-arid climate where average highs during summers routinely exceed 40°C and during winters may be as low as 4.9°C. An association will reflect the quality of perioperative anaesthetic management in terms of temperature control of the perioperative facility. This study is being conducted as a part of quality improvement measure.

MATERIALS AND METHODS

This descriptive case series was carried out at Department of Anaesthesia, Jinnah Hospital Lahore from 1st January 2022 to 30th June 2022. A sample size of 200 is calculated using the WHO software for sample size determination in health studies with confidence level 95%, absolute precision and 7% anticipated proportion of postoperative shivering 45%.[9] All patients undergoing caesarean section with ASA grade II and age 15-40 years were included. Patients with hypertension, thyroid dysfunction, diabetes mellitus, ASA grade III and more, age <15 or >40 years, obese patients (BMI >30), initial body temperature >38°C or <36°C, and anticipated massive blood transfusion/rapid fluid administration were excluded. Using 3 ml of strong bupivacaine 0.5% (15 mg), spinal anaesthesia was given in a sitting position in the L3–L4 or L4–L5 interspace using a strict aseptic method. The patients were then placed in a supine posture, covered with surgical drapes without active warming, and given extra oxygen at a rate of 4 L/min via a face mask. Monitoring comprised non-invasive arterial blood pressure measurements every five minutes, core temperature monitoring, pulse oximetry, and ECG (leads II and V with ST segment analysis). After the procedure, the patients were taken to the recovery area, where they were kept under observation, wrapped in a cotton blanket, and given extra oxygen through a facemask at a rate of 4 L/min. The recovery area was kept at a

temperature of 22°C. Before and just after the intrathecal injection, patients were assessed for core temperature (tympanic membrane temperature) by an anaesthesiologist. After spinal anaesthesia, patients were monitored for 15 minutes, during which time shivering was seen. Administration of spinal anaesthesia and collection of data in Operation Theater regarding grade of shivering and efficacy of drug was done by an anaesthetist having 5 years of experience. The data was entered in SPSS-21.0 for statistical analysis to examine the comparability of both groups. *P* value ≤0.05 was deemed statistically significant.

RESULTS

The shivering was found in 107 (53.50%) patients (Fig. 1).The mean age was 26.33±7.47 years, mean gestational age was 38.32±1.064 weeks, mean BMI was 24.79±2.95 kg/m^{2,} mean temperature was 37.07±0.54°C (Table 1). Patients having age ≤30 years the shivering was found in 80 (58.4%) patients and in patients having age >30 years the shivering was found in 27 (42.9%) patients, statistically the difference was significant (p=0.041), gestational age 37-38 weeks the shivering was found in 60 (51.3%) patients and in patients having gestational age 38-39 weeks the shivering was found in 47(56.6%) patients and difference was statistically insignificant (P=0.455), BMI ≤25 kg/m^2 the shivering was found in 53 (51.0%) patients and in patients having BMI >25 kg/m^2 the shivering was found in 54 (56.2%) patients and difference was statistically insignificant (P=0.454), and temperature ≤37 the shivering was found in 49(49.5%) patients and in patients having temperature >37 the shivering was found in 58 (57.4%) patients, difference was statistically insignificant (P=0.261) [Table 2].

Table 1: Descriptive statistics of patients (n=200)

Variable	Mean±SD
Age (years)	26.33±7.47
Gestational age (weeks)	38.32±1.06
Body mass index (kg/m^2)	24.79±2.95
Temperature	37.07±0.54

Table 2: Comparison of shivering with age, gestational age, body mass index and temperature

Variable		Shivering		P value
		Yes	No	
Age (years)	≤ 30	80 (58.4%)	57 (41.6%)	0.041
	>30	27 (42.9%)	36 (57.1%)	
Gestational age (weeks)	37-38	60 (51.3%)	57 (48.7%)	0.455
	38-39	47 (56.6%)	36 (43.4%)	
Body mass index (kg/m^2)	≤25	53 (51%)	51 (49%)	0.454
	>25	54 (56.2%)	42 (43.8%)	
Temperature	≤37	49 (49.5%)	50 (50.5%)	0.261
	>37	58 (57.4%)	43 (42.6%)	

Fig. 1: Frequency distribution of shivering

DISCUSSION

Shivering is a prevalent adverse consequence of spinal anaesthesia.[10] Shivering is a prevalent and distressing consequence of spinal anaesthesia (SA), resulting in discomfort and dissatisfaction among parturients having caesarean sections (CSs). Post-spinal shivering elevates the body's basal metabolic oxygen demand by approximately 200-500%, which can compromise myocardial function in patients with pre-existing limited myocardial oxygen supply, such as those with arteriosclerosis. This exacerbates morbidity due to increased vascular resistance from vasoconstriction, compounded by heat and carbon dioxide production resulting from hypothermia, leading to further oxygen depletion.[11-13]

This study showed that in winter the shivering was found in 107(53.50%) patients (Fig. 1). Comparison of gestational ages, BMI groups and temperature groups showed statistically insignificant difference between shivering status (Table 3).

Ferede et al[14] documented in their study that the total incidence of intraoperative shivering following caesarean section delivery under spinal anaesthesia was 51.8%. The majority of patients who experienced shivering did so after 20 minutes of spinal anaesthesia and the occurrence of postoperative shivering in patients receiving spinal anaesthesia ranges from 40% to 56.7%. An elevated spinal block is recognised to reduce core temperature, with a decrease of 0.15°C for each dermatome increment in block level.[8]

Shivering presents common and unwelcome consequences, resulting in discomfort and unhappiness among surgical patients, with incidence rates reported between 50% and 60% in most investigations.[15-17] Another study indicated that the incidence of post-anesthesia shivering varies from 5% to 65% after general anaesthesia and is 55% following spinal anaesthesia.[18]The prevalence of shivering under neuraxial anaesthesia was observed to be approximately 55%.[19] Kishore et al[20] indicated that the temperature of bupivacaine was modified to 4°C, 22°C, and 37°C for spinal anaesthesia, revealing an overall shivering incidence of 49.52% across all three groups. Nonetheless, the temperature modulation of hyperbaric bupivacaine for spinal anaesthesia did not influence the occurrence of shivering when comparing the groups. The outcomes of the current investigation were analogous to those of other studies conducted in different countries, despite the use of forced-air warming and warmed intravenous fluid infusions preoperatively.[19,21,22]

Shivering among patients undergoing caesarean delivery with spinal anaesthesia varied from 36% to 85%, as spinal anaesthesia is the predominant procedure in affluent nations.[10,23,24] Nasseri et al[25] found that the incidence of shivering was substantially greater in the BN group (52%) compared to the BD group (24%) (P=0.04). The intensity of shivering was considerably greater in the BN group compared to the BD group (P=0.04). The occurrence of adverse events, including hypotension, nausea/vomiting, and bradycardia, did not differ significantly between the two groups; however, the sedation level was greater

in the BD group compared to the BN group (P=0.004). Recent investigations indicate that fluid warming does not decrease the incidence of shivering nor does it reduce variance in maternal temperature following caesarean surgery, so reinforcing the hypothesis that shivering is a consequence of spinal anaesthesia.[26,27] A study by Luggya et al[28] demonstrated a reduced incidence of shivering following spinal anaesthesia, involving 270 patients, predominantly emergency caesarean deliveries (90.74%), primarily attributed to failed progress from cephalopelvic disproportion. Shivering occurred in 8.15% of cases, predominantly at the 20-minute mark, with hypotension and hypothermia identified as associated factors. Intravenous pethidine (meperidine) 25 mg significantly alleviated shivering.

CONCLUSION

The frequency of shivering is 53.50%after spinal anaesthesia in patients undergoing caesarean section in winter.

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