

Prevalence of Post-Spinal Anesthesia Shivering and Associated Factors in Patients Undergoing Cesarean Section with Spinal Anesthesia in Lady Reading Hospital Peshawar, Pakistan

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Abstract

Objective: To determine the prevalence of Post-spinal anesthesia shivering and associated factors in patients undergoing Cesarean section Surgery in Lady Reading Hospital Peshawar.

Methodology: This observational study was conducted in Lady Reading Hospital Peshawar. One hundred seventy-three patients were included in the study undergoing Spinal Anesthesia for elective or emergency caesarian section from June 2023 to September 2023. ASA class II (American Society of Anesthesiologists) and class III patients were recruited into the study, and non-consenting were excluded. A standard dose of 0.5% bupivacaine was administered as spinal anesthesia and standard monitoring recording was conducted every 5 minutes during the surgery. Shivering was monitored till the discharge of the patient to the ward.

Results: Out of 173 patients included in the study, only 18 surgeries were elective, and the rest, 155, were emergency cesarean section surgeries. Among emergency surgeries, the highest number of indications was Poor progression of labor, 29.6%. Post-spinal anesthesia shivering was recorded in 146 patients, 15.6%. Most of the post-spinal anesthesia was also associated with Hypothermia (92.5%) and hypotension (96.2%).

Conclusion: Post-spinal shivering was observed in 15.6% of the patients, with hypothermia and hypotension as associated factors.

Keywords: Post spinal shivering, hypothermia, spinal anesthesia, hypotension, cesarean section.

Introduction

Physiological and behavioral changes keep the body temperature normal (36.5 to 37.5 C) no matter what the external environment temperature and conditions are. It is done through the autonomic nervous system.¹ Decline phase in temperature of the body occurs during anesthesia, where the sharp decline occurs during the first 30 minutes, and after 3-4 hours, reduced heat loss causes equilibrium in body temperature regulation, which happens to be a process consisting of several phases.^{2,3}

During surgical procedures, evaporation from the exposed sites of the body, along with exposure to a cold environment, causes heat loss from the body. The administration of fluids that are not warmed contributes to hypothermia, causing shivering in the body, which is actually a compensation mechanism. A decrease in core temperature leads to shivering, decreased immunity, coagulopathy, and risk of cardiac morbidity along with an increase in stay in hospital.^{4,5}

Post Spinal shivering, which is a very disturbing and unpleasant phenomenon, can be divided into grades according to the Crossley and Mahajan scale. It ranges from the mild form, where there are skin eruptions, to severe, where there is continuous skeletal muscle contraction. The prevalence of severe form in a study is reported to be 50 to 80%.⁶

The exact mechanism is unknown, but a few theories regarding post-spinal shivering exist. One of these suggests that there is hypothermia, which in turn stimulates a thermoregulatory response. This response causes changes in the pontine, medullary reticular formation, and mesencephalic reticular formation neurons.⁷

Clinically, it's clonic or tonic skeletal muscle contractions of different frequencies, and it increases metabolic heat production up to more than 500% above normal level.^{8,9} It results in hypoxemia, hypercarbia, and lactic acidosis as it increases the consumption of oxygen and carbon dioxide production. It also worsens pain sensations along with general discomfort.⁶

Such an important adverse event associated with spinal anesthesia can't be predicted due to no data availability at Lady reading hospital about the prevalence of post spinal shivering in patients undergoing C section. So we determine through this study the prevalence of post spinal anesthesia and associated factors in patients undergoing cesarean section for at lady reading hospital Peshawar.

Methodology

A cross-sectional study was conducted at Department of Anesthesia, Lady Reading Hospital, Peshawar after the ethical approval of the Data was collected from

June 2023 to September 2023.

The sample size was determined using a previous study of 2009⁹ and using Kish and Leslie's (1965) formula with 95 % confidence, with a 50 % chosen precision and Z being 1.96 plus factoring in loss to follow up (5 %) we derived a sample size of 173. American Society of Anesthesiologists (ASA) II and III mothers admitted for C-sections were included in the study. Non-consenting, allergic to drugs, and patients with contraindications for spinal anesthesia were excluded. Patients having recorded fever with rigors and chills were also excluded.

Under aseptic conditions, all patients received standard care at the operation theatre of the Gynecology and Obstetrics department. Bupivacaine 2 ml of 0.5% was administered as spinal anesthesia. Patients were placed in the recommended position, left lateral until bilateral T6 block was achieved. Surgery was started after the commencement of anesthesia. Room temperature was kept from 22° to 27°. All patients' axilla temperature was measured. At every 5 minutes interval, vitals were recorded for each patient.

If any shivering was observed it was noted with time and classified as well which was our main study outcome. Shivering was classified according to Crossley and Mahajan Scale. 10 Other outcomes identified were hypotension and hypothermia. All the patients were also monitored in post anesthesia care unit (PACU) at 5 minutes interval. All patients were followed for 24 Hours.

Interviewer administered, semi-structured, and pre-coded questionnaire was used to collect data containing demographic data, main outcome, and other variables. The main study outcome was shivering. The main independent variable was the time to develop shivering. The other independent variables considered were hypotension and hypothermia. Data was analyzed using SPSS Version 22. Chi-square test was used to determine the association between predictor and outcome variables. $P < 0.05$ was considered statistically significant. A pre-test was conducted on 5% of patients from the sample size and was checked for accuracy, completeness, and clarity.

Results

Four hundred patients were screened, and out of them, 173 mothers were recruited into the study. Characteristics of participants are described in Table 1.

The highest percentage was a poor progression of labor which was 29.6%, antepartum hemorrhage at 21.2%; abnormal presentation at 16.7%; fetal distress at 14.1%; previous C section, 11.6%, and the lowest percentage were contracted pelvis, 6.4%. Indication of surgery was not significantly associated with outcome.

15.60% (27 patients) of the total patients showed

post-spinal shivering, while 84.3% (146 patients) did not show any shivering. Patients were observed for 24 hours following surgery.

Shivering grading was done according to Crossley and Mahajan grading system.¹⁰ It is shown in Graph 3.

Out of 27 patients, 13 (48%) showed grade 1 shivering, 11 (40.7%) showed grade 2 shivering and 3 (11.1%) showed grade 3 shivering while no patient showed grade 4 shivering.

Commonly time of observation of shivering was between 15 and 20 minutes. Time noted for shivering observed in patients is shown in Table 2.

Hypothermia and Hypotension were associated factors observed in patients with shivering. Among 27 patients with shivering 25(92.5%) were noted to have hypothermia and 26(96.2%) were noted to have hypotension. Mean body temperature of patients with shivering was 35.9±1 C. Mean Arterial Pressure among patients with shivering was 69±3 mmHg.

30 to 50 mg of ketorolac were given to all patients with shivering which relieved the shivering within 4 to 5 minutes of administration. No side effect was observed in PACU.

Table 1. Characteristics of parturient

Characteristics	Figures
Mean Age of mothers	26±1.4
Mean Systolic Blood Pressure	129.5±2
Mean MAP	91.1±1.9
Mean Heart Rate	99±1
Emergency Surgery	155 (89.5%)
Elective Surgery	18(10.4%)

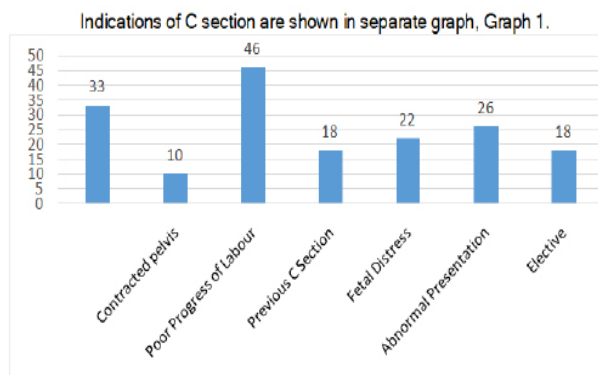
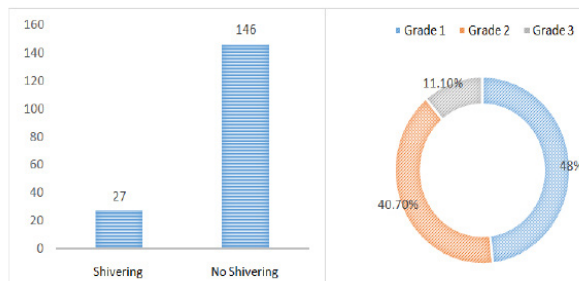


Figure 1: Bar Chart showing Indication for Emergency C Section.



Graph 2: Bar Chart showing Prevalence of Shivering.

Graph 3: Shivering Grades percentages

Table 2. Shivering time

Time	Number of Observation/ shivering Episodes
5 minutes	2
10 minutes	4
15 minutes	6
20 Minutes	12
25 Minutes	2
30 minutes	1

Discussion

There are limited recent published studies determining the prevalence of shivering after spinal anesthesia. Most of the studies that are published are about the treatment of post-spinal shivering and the comparison of different drugs to prevent or control shivering. This study was conducted because post-operative shivering is overlooked in Lady Reading Hospital and is easily preventable. It's one of the main causes of discomfort. Studies have ranked it 8th as a complication of post-spinal anesthesia.¹¹ Very few studies are available worldwide, and there is no published study about the incidence or prevalence of post-spinal anesthesia in Pakistan. Our results are comparable to other studies. A similar study conducted in India in 2022 showed the incidence of post-spinal shivering more than 40%, which is higher than our results.¹² That study included the participants who planned for other lower abdominal and lower limb surgeries. Our study is different in that we have included only Cesarean section surgeries. All the patients included in that study were admitted for elective procedures that were completed in over two years' time. Another study conducted in Nepal in 2017 showed that shivering after spinal anesthesia ranges from 10 to 50% in patients.¹³ 120 patients were included in that study. The result of that study is similar to this study. That study was not limited to caesarian section surgeries, and the study also shed light on the prevention of post-spinal shivering.

A similar study conducted in Ethiopia in 2021, where a relatively high number of patients were included in the study, showed that around 51% of the patients develop post-spinal shivering.¹⁴

Another study conducted in 2018 in Spain showed also showed higher incidence of shivering after spinal anesthesia.¹⁵ The study also included patients of lower limb surgery and other lower abdominal surgeries. This study is different as it's conducted on patients undergoing C section.

A similar study conducted in Uganda in 2016, where the same type of patients were participants, showed that post-spinal shivering in patients undergoing C-sections is 8.15%, which is lower than the prevalence observed in this study.¹⁶ This might be because, in that study, the author discussed the fluid warming protocol before infusion in the study area. In this study, we could not follow the protocols because of heavy emergencies in the hospital. A comparative study conducted in 2005 in Turkey has shown that the prevalence of post-anesthesia shivering is from 5% to 60% in general anesthesia and 30% in regional anesthesia.¹⁷ This number is higher than the results of this study. According to a study conducted in 1990 in the USA, there are some associated factors, which include type of anesthesia, duration of surgery, level of blockage, age, operating room temp, and fluids.¹⁸ In this study, only a single type of surgery and anesthesia was studied. No significant correlation between age and outcome was found. Hypothermia and hypotension were the only associated factors observed in this study. Another comparative study conducted in Germany showed that the magnitude of post-spinal shivering is more than 50%, although they have used forced air warming and warm intravenous infusion before surgery.¹⁹ Another study conducted in Germany showed somewhat similar results to our study. It ranged from 20% to 40%.²⁰

Some of the studies conducted, like one in the UK, showed that the male gender is more likely to develop shivering than the female.²¹ It might be because the female body has a higher core temperature than the male body. Some other studies, like the one conducted in the UK, showed that there is no difference in post-spinal shivering between males and females.²²

This study doesn't compare genders, as all the patients included are female. A study conducted in Korea showed that young patients develop shivering more often than old age patients.²³ However, in this study, no such difference was found. In our study, hypothermia is one of the main factors associated with shivering, and it's also being demonstrated in different studies conducted worldwide.^{24,25} Several studies also found hypotension associated with shivering in patients.^{16,26} These results are comparable to our study, where we found hypothermia and hypotension associated with post-spinal shivering.

Our study limitation is that we have not commented on

the prevention and treatment of the outcome, which needs further exploration in our study area.

Conclusion:

The prevalence of Post-Spinal Shivering in patients undergoing C-sections was 15.6%, occurring commonly on 15 and 20 minutes of induction of anesthesia.

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