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### “AN OBSERVATIONAL STUDY ON THE RISK FACTORS ASSOCIATED WITH INTRA-OPERATIVE SHIVERING IN PATIENTS UNDERGOING CAESAREAN SECTION UNDER SPINAL ANAESTHESIA”

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#### **ABSTRACT**

**BACKGROUND:** Shivering frequently occurs during spinal anaesthesia for caesarean sections (CS). It might affect a patient's physiology by making them consume more oxygen, but it might also change how a parturient gives birth. Although there is speculation that it is related to intra-operative hypothermia, the exact mechanism and risk factors are still unknown.

**METHODS:** A prospective observational study was conducted to investigate the risk variables for intra-operative shivering in patients undergoing caesarean section under spinal anaesthesia. Sixty individuals were recruited for elective caesarean section (CS) under spinal anaesthesia. Anxiety scale was used to assess anxiety levels and also ambient OT- temperature was noted (23°C), The Bedside Shivering Assessment Scale (BSAS) was used to assess parturient shivering. Also, potential risk factors, age, weight, height, Body Mass Index (BMI), and American Society of Anaesthesiologists (ASA) score were explored.

**RESULTS:** Therefore the overall incidence of shivering during the intra-operative period was 42 patients (70%) undergoing caesarean section. The incidence of shivering due to anxiety was (38.3%) and the incidence of shivering due to OT-temperature was (31.6%). Based on Bedside Shivering Assessment Scale (BSAS), Before administering spinal anaesthesia 65.2% of the study population showed mild anxiety levels, 17.39% with moderate anxiety levels and 4.34% with severe anxiety levels. After administering spinal anaesthesia, 52.17% showed mild anxiety levels and 26.08% showed moderate anxiety levels. So the highest incidence (38.3%) of shivering was due to anxiety.

**CONCLUSION:** In this study, the causes of shivering in the operating room were anxiety, hypothermia, other operating room procedures like, skin disinfection, out of which anxiety being the foremost reason for shivering. Therefore, we conclude that anxiety was the prime reason for shivering during caesarean section.

## INTRODUCTION:

Spinal anaesthesia is a safe technique that has been widely used and tested in the gynaecological field, so much so that it is considered the first choice technique in caesarean section, allowing for the rapid acquisition of a valid sensor and motor block. The benefit of spinal anaesthesia is that it blocks pain quickly, with only a small dose of anaesthetic being used.

Regional anaesthesia particularly spinal anaesthesia, has been favoured as the best choice for elective uncomplicated caesarean delivery due to its avoidance of the

airway, lower risk of gastric content aspiration, and ease of performance(1). It is safe and effective, but it can cause hypotension, local anaesthetic toxicity, post-dural puncture headache (PDPH), and nerve damage(2)

Among the reasons for this preference are that it is simple to administer, relatively safe, provides a consistent onset of anaesthesia with no effect on the unborn baby, and offers lower cost, early ambulation, breastfeeding initiation, and a shorter hospital stay than general anaesthesia(3).

Although patients receiving spinal anaesthesia had a high rate of patient satisfaction, there was patient satisfaction some dissatisfaction with the preoperative explanation due to labour pain, discomfort during the operation, pain at the surgical site, and back pain in the postoperative period(4)

The aetiology of the shivering is unknown, but it may involve a combination of mechanisms such as thermoregulatory threshold modulation, changes in body heat distribution, reduction in body core temperature, and the cooling effect of fluids injected into the neuron axis(5). During spinal or epidural anaesthesia, redistribution of body heat typically results in a decrease in core temperature (0.5-1.0°C)(6).

Shivering is an unpleasant, discomforting and common consequence after surgery that can range from modest skin eruptions to severe generalised continuous skeletal muscle spasms. It can also interfere with electrocardiogram, blood pressure, and

oxygen saturation monitoring. It causes an increase in oxygen use, lactic acidosis, and carbon dioxide generation, as well as a decrease in patient satisfaction and discomfort. Shivering also raises the mortality and morbidity rates in individuals with cardiovascular disease by increasing cardiac output and metabolic heat generation up to 600% over basal levels(7).

Identifying and reducing the risk factors for intra- operative shivering may decrease the incidence of shivering and enhance material outcomes. Several earlier studies indicated that anxiety, hypotension, and hypothermia may be linked with intra- operative shivering during caesarean section, but another study failed to show a link between anxiety and shivering during surgical operations.

Other factors, such as the origin of the patient transfer (from the delivery room or the obstetric ward) and surgery indication, may also influence shivering.

Our study helps in finding the reason why shivering occurs during intraoperative period.

## AIMS AND OBJECTIVES

### AIMS:

The aim of the study is to assess the risk factors associated with intra-operative shivering in patients undergoing caesarean section under spinal anaesthesia

**OBJECTIVES:**

- To observe the effect of pre-operative anxiety on intra-operative shivering.
- To observe the effect of ambient OT-temperature on intra-operative shivering.
- To look for any other causes of shivering.

**MATERIALS AND METHODS**

It was an observational study performed on 60 pregnant women who underwent caesarean section surgeries under spinal anaesthesia. All pregnant women of age group >18 years, ASA physical status [ASA I, II and III], both elective and emergency were included. Non pregnant women, 0 patients undergoing any surgeries under general anaesthesia and patients not willing to take part in this study were excluded from the study,

**Study procedure:**

After obtaining Institutional Human Ethics Committee approval (IHEC), the study was conducted in the Department of Anaesthesiology, CHRI, Kelambakkam. This study was performed on 60 patients, after obtaining the informed consent from the patients subjected for elective and emergency caesarean section were included in the study. After shifting the patient to an operation theatre, Standard monitoring of Non-invasive Blood pressure (NIBP), Electro-cardiogram (ECG), Pulse oximetry was established and 18G Intravenous (IV) cannula was secured for fluid resuscitation. Spinal anaesthesia was performed with the standard technique by an attending anaesthesiologist. Anxiety level of each patients was evaluated using anxiety scale. Ambient temperature of the OT maintained constantly throughout the surgery. After achieving adequate sensory and motor blockade, surgery was allowed to proceed. Before and after the spinal anaesthesia was given, shivering if present was noted and evaluated using [Bedside Shivering Assessment Scale (BSAS)]. The patient was enquired whether the shivering was due to anxiety or operation theatre temperature. So the aim of the study was to observe the risk factors associated with

intra-operative shivering in patient undergoing caesarean section under spinal anaesthesia.

The degree of shivering was determined with a score from 0 to 3 on the Bedside Shivering Assessment scale (BSAS),

- |   |   |
|---|---|
| 0 | – No shivering  |
| 1 | – Mild shivering (localized to neck/thorax)   |
| 3 | – Moderate shivering (intermittent involvement of upper extremities/+thorax)        |
| 4 | – Severe shivering (generalized shivering or sustained upper extremities shivering) |

The level of anxiety was determined by anxiety scale:

**MINIMAL** – (Small feelings of worry/anxiety, Able to get things done and focus on tasks, Little to no physical symptoms.)

**MILD**- (Anxious throughout the day but not all day, Some changes in concentration and sleep, stomach ache and muscle tension.)

**MODERATE**-(Anxious most of the day, Changes in sleep, appetite, concentration, Avoidance, Feeling panicky, headaches, and fatigue.)

**SEVERE**- (Anxiety all day, Feeling breathless, chest tightness, digestive issues, Unable to focus, Sensory overload, Isolation)

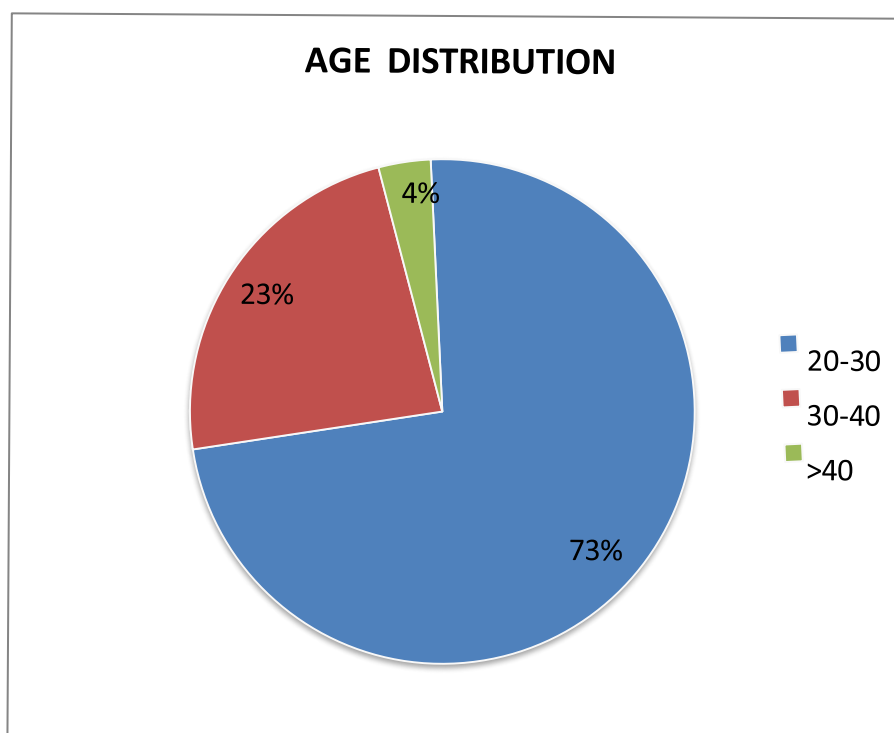
**DEBILITATING**-(Severe anxiety all day, Panic attacks, Can't function, Intense Physical symptoms,Feeling paralyzed, Meltdowns, Obsessive thoughts.)

## RESULTS

**TABLE 6.1: DISTRIBUTION OF AGE IN THE STUDY POPULATION: [n=60]**

	FREQUENCY	PERCENTAGE
20-30 years	44	73.3%
30-40 years	14	23.3%
>40 years	2	3.3%
TOTAL	60	100%

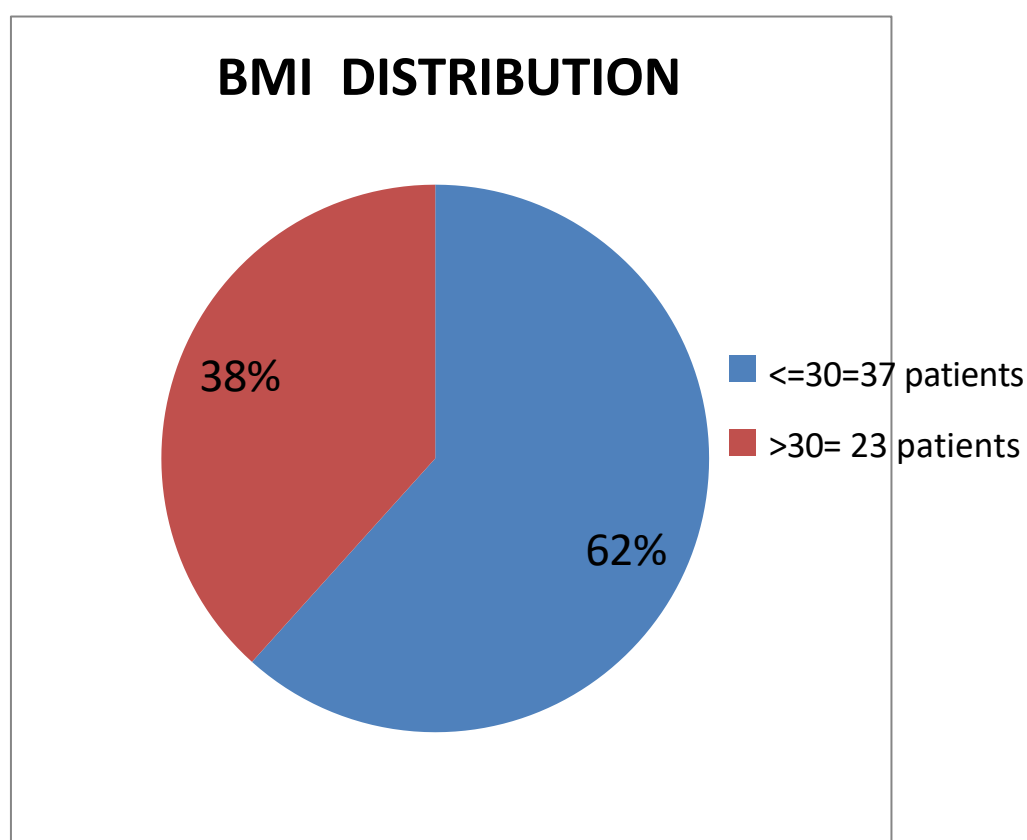
**FIGURE 6.1.1: PIE CHART REPRESENTING THE VARIOUS AGE GROUP**



**PARTICIPATING IN THIS STUDY**

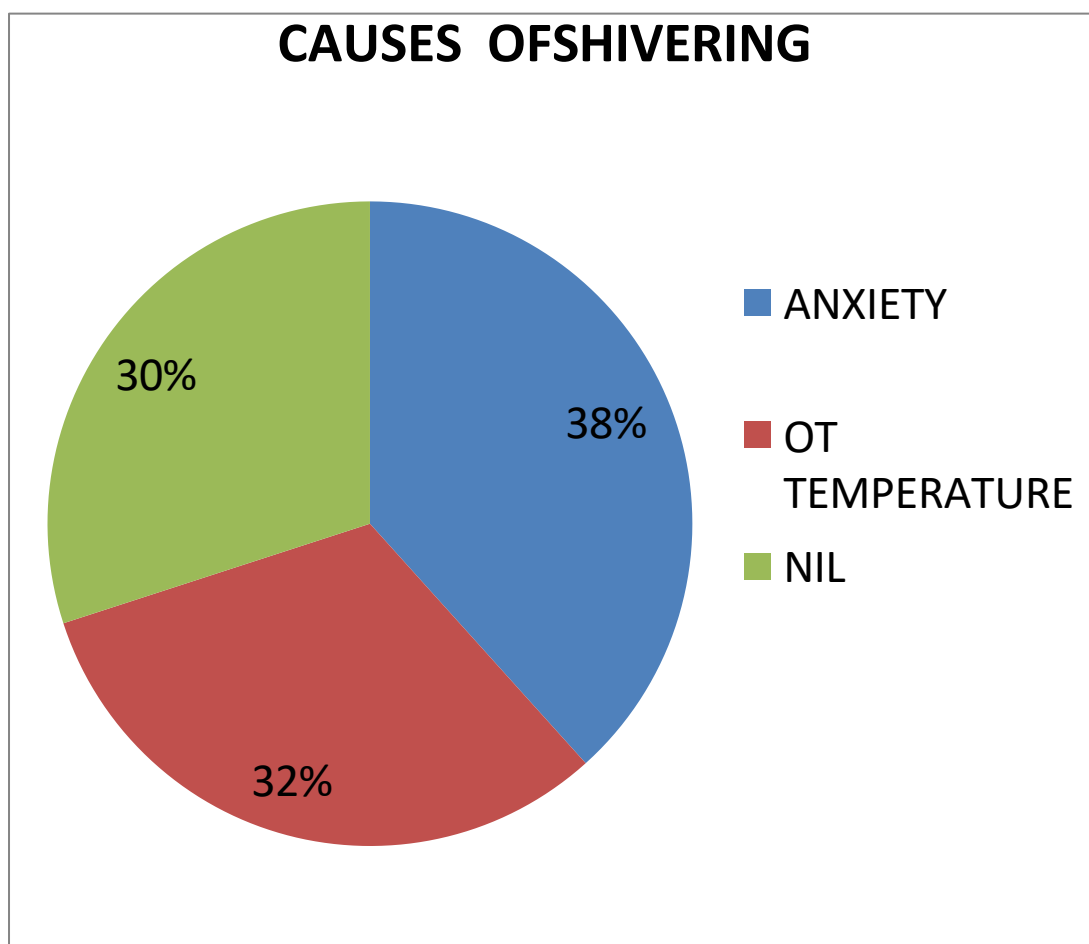
**TABLE 6.2: DISTRIBUTION OF BMI IN THE STUDY POPULATION: [n=60]**

	<b>FREQUENCY</b>	<b>PERCENTAGE</b>
<=30	37	61.6%
>30	23	38.3%
<b>TOTAL</b>	<b>60</b>	<b>100%</b>

**FIGURE 6.2.1: PIE CHART REPRESENTING THE BMI OF VARIOUS GROUP PARTICIPATING IN THIS STUDY**

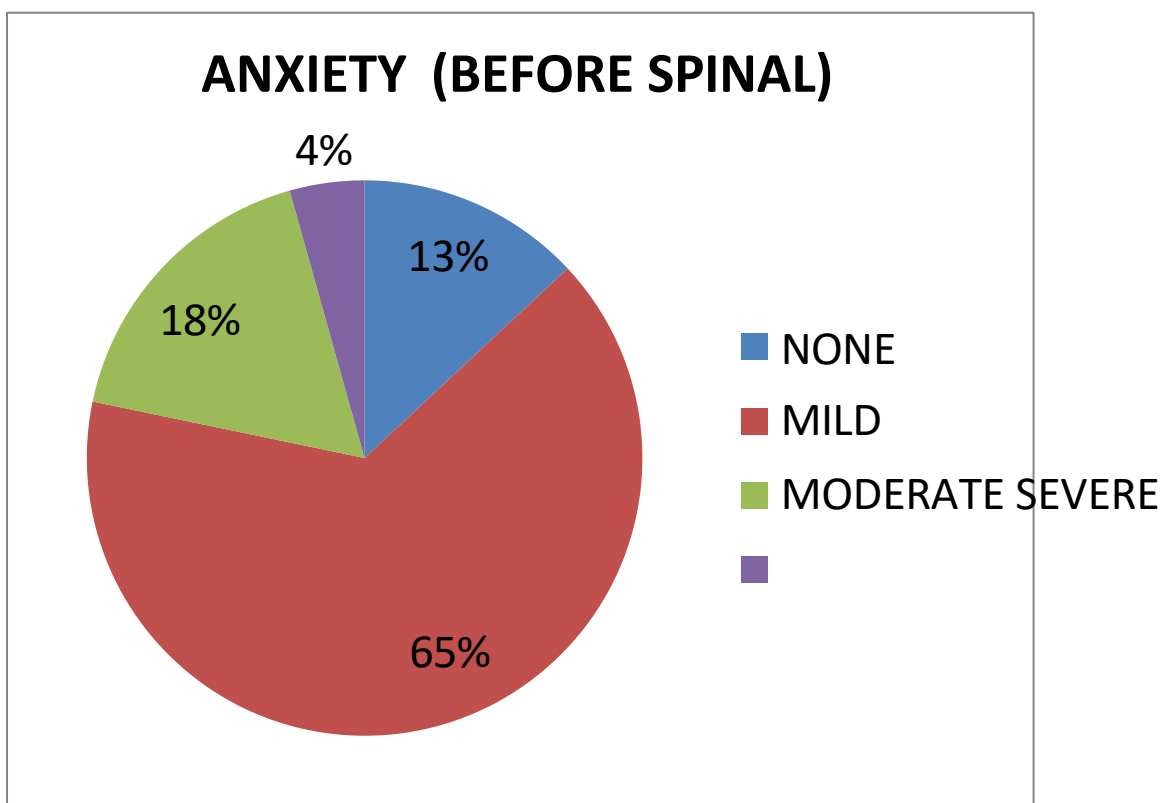
**TABLE 6.3: DISTRIBUTION OF CAUSES OF SHIVERING IN THE STUDY POPULATION:  
[n=60]**

	FREQUENCY	PERCENTAGE
ANXIETY	23	38.3
OT TEMPERATURE	19	31.6
NIL	18	30
TOTAL	60	100

**FIGURE 6.3.1: PIE CHART REPRESENTING THE CAUSES OF SHIVERING OF VARIOUS GROUP PARTICIPATING IN THIS STUDY**

**TABLE 6.4: DISTRIBUTION OF ANXIETY ON SHIVERING (BEFORE SPINAL) IN THE STUDY POPULATION: [n=23]**

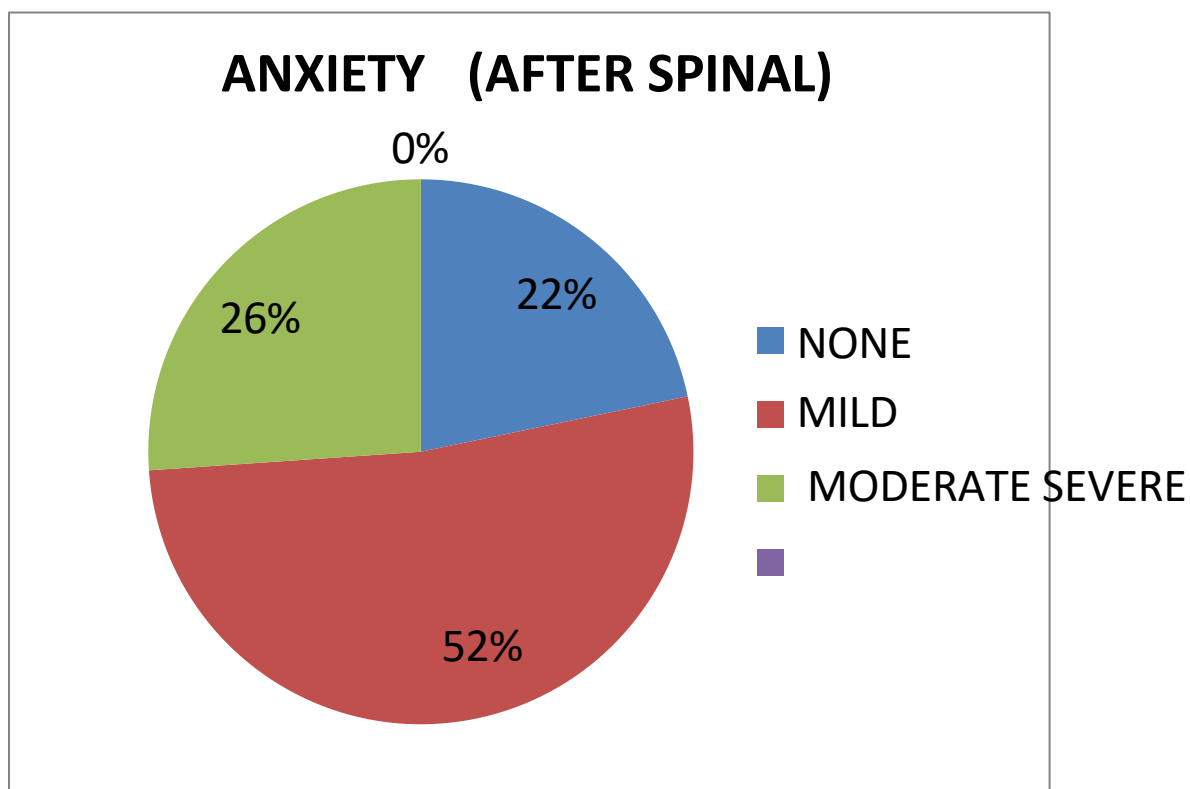
	<b>FREQUENCY</b>	<b>PERCENTAGE</b>
NONE	3	13.04%
MILD	15	65.2%
MODERATE	4	17.39%
SEVERE	1	4.34%
TOTAL	23	100%



**FIGURE 6.4.1:PIE CHART REPRESENTING VARIOUS GROUP OF PATIENTS EXPERIENCING ANXIETY ON SHIVERING (BEFORE SPINAL)**

**TABLE 6.5: DISTRIBUTION OF ANXIETY ON SHIVERING(AFTER SPINAL) IN THE STUDY POPULATION: [n=23]**

	<b>FREQUENCY</b>	<b>PERCENTAGE</b>
NONE	5	21.73%
MILD	12	52.17%
MODERATE	6	26.08%
SEVERE	0	0%
TOTAL	23	100%

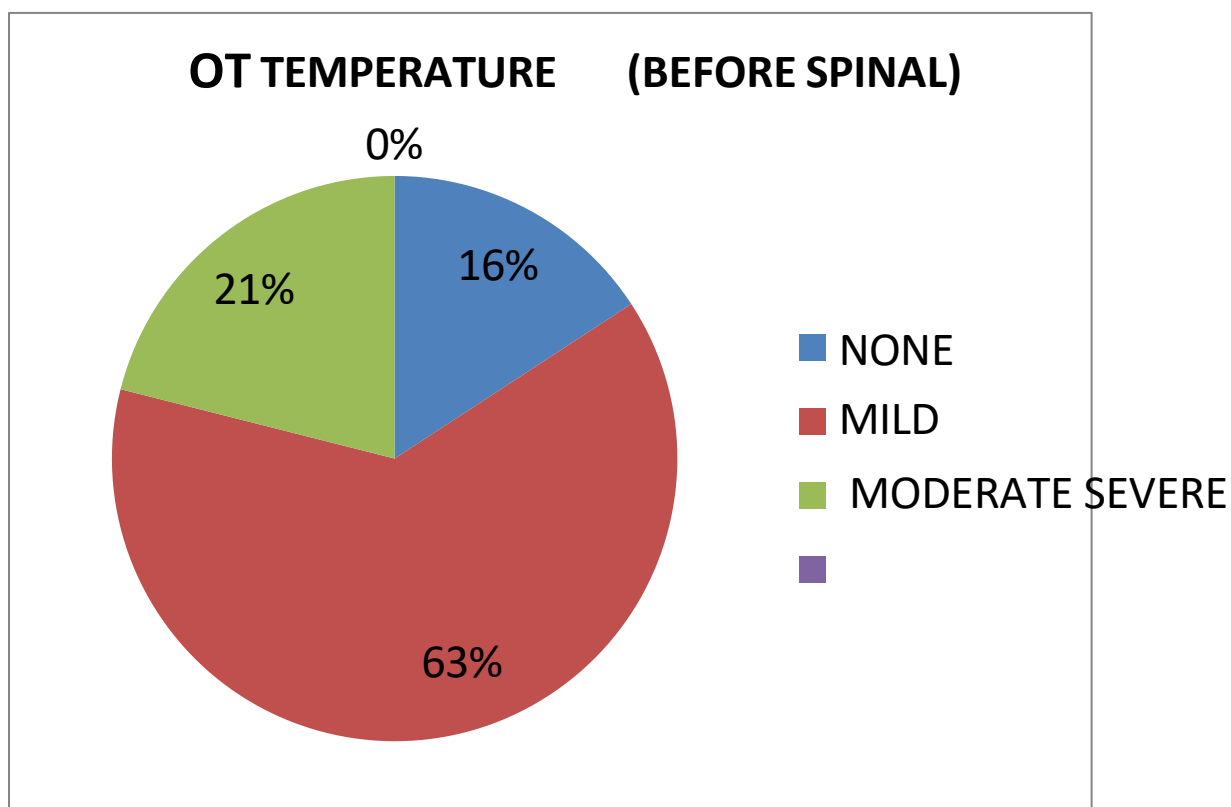


**FIGURE 6.5.1: PIE CHART REPRESENTING VARIOUS GROUP OF PATIENTS EXPERIENCING ANXIETY ON SHIVERING (AFTER SPINAL).**



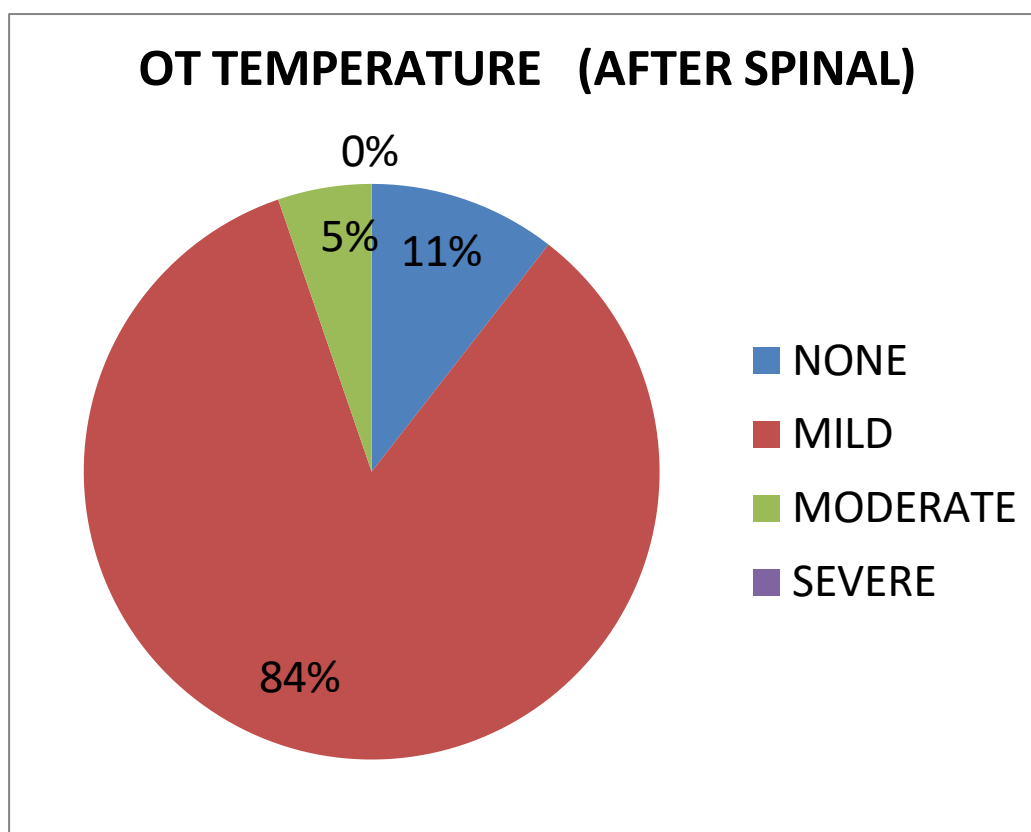
**TABLE 6.6: EFFECT OF OT- TEMPERATURE ON SHIVERING (BEFORE SPINAL) IN THE STUDY POPULATION: [n=19]**

	FREQUENCY	PERCENTAGE
NONE	3	15.78%
MILD	12	66.15%
MODERATE	4	21.05%
SEVERE	0	0%
TOTAL	19	100%

**FIGURE 6.6.1: PIE CHART REPRESENTING VARIOUS GROUP OF PATIENTS EXPERIENCING EFFECT OF OT- TEMPERATURE ON SHIVERING(BEFORE SPINAL)**

**TABLE 6.7: EFFECT OF OT- TEMPERATURE ON SHIVERING (AFTER SPINAL) IN THE STUDY POPULATION: [n=19]**

	FREQUENCY	PERCENTAGE
NONE	2	10.52
MILD	16	84.21
MODERATE	1	5.26
SEVERE	0	0
TOTAL	19	100



**FIGURE 6.7.1: PIE CHART REPRESENTING VARIOUS GROUP OF PATIENTS EXPERIENCING EFFECT OF OT- TEMPERATURE ON SHIVERING( AFTER SPINAL)**

## Contingency Tables

CAUSES OF SHIVERING				
Before Spinal	None	Anxiety	OT-Temperature	Total
None	18	3	3	24
Mild	0	15	12	27
Moderate	0	4	4	8
Severe	0	1	0	1
Total	18	23	19	60

$\chi^2$  Tests

	Value	df	p
$\chi^2$	39.9	6	< .001
N	60		

## Contingency Tables

Contingency Tables

CAUSES OF SHIVERING				
After Spinal	None	Anxiety	OT-Temperature	Total
None	18	5	2	25
Mild	0	12	16	28
Moderate	0	6	1	7
Total	18	23	19	60

$\chi^2$  Tests

	Value	df	p
$\chi^2$	42.5	4	< .001
N	60		

## Contingency Tables

## After Spinal

Before Spinal	None	Mild	Moderate	Total
None	18	6	0	24
Mild	7	18	2	27
Moderate	0	4	4	8
Severe	0	0	1	1
Total	25	28	7	60

 $\chi^2$  Tests

	Value	df	p
$\chi^2$	37.0	6	< .001
N	60		

**DISCUSSION**

A prospective observational study was conducted in order to identify the risk factors associated with intra-operative shivering in patients undergoing caesarean section under spinal anaesthesia. A total of 60 patients were evaluated for caesarean section under spinal anaesthesia. Anxiety scale was used to assess anxiety levels and also ambient OT- temperature was noted (23°C) The Bedside Shivering Assessment Scale(BSAS) was used to assess parturient shivering. In this study Age, BMI, Anxiety levels, OT- temperature were recorded. The overall incidence of shivering during the intra-operative period was 42 patients (70%) undergoing caesarean section. The incidence of shivering due to anxiety was (38.3%) and the incidence of shivering due to OT-temperature was (31.6%). Based on Bedside Shivering Assessment Scale (BSAS), In before spinal, 65.2% of the study population showed mild anxiety levels, 17.39% with moderate anxiety levels and 4.34% with severe anxiety levels. In after spinal, 52.17% showed mild anxiety levels and 26.08% showed moderate anxiety levels. So the highest incidence (38.3%) of shivering was due to anxiety.

A similar study was undertaken by Xiaofei Qi, in 2022(8) and conducted a study on 212 caesarean section parturient. The overall incidence of shivering was 89(42.0%). It showed that anxiety, emergency delivery and transfer from the delivery room to the operating room increased the overall shivering incidence. The peak shivering occurred after skin disinfection. So he concluded that shivering occurred frequently during caesarean section with the peak incidence occurring after skin disinfection. Anxiety, emergency delivery and transfer from the delivery room to operating room increased the risk of shivering development during caesarean section.

**CONCLUSION**

In this study, the causes of shivering in the operating room were anxiety, hypothermia, other operating room procedures like, skin disinfection, out of which anxiety being the foremost reason for shivering. Therefore, we conclude that anxiety was the prime reason for shivering during caesarean section.

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