

## Effect of Lower Limb Compression Stockings on Hemodynamic Stability in Obstetric Patients undergoing Lower Segment Cesarean Section under Spinal Anaesthesia

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### ABSTRACT

**Objective:** To compare the effects of lower limb compression stockings and control in terms of frequency of bradycardia, hypotension and hypotensive symptoms in a group of obstetric patients undergoing lower segment cesarean section under spinal anaesthesia.

**Study Design:** Quasi-experimental study.

**Place and Duration of Study:** Department of Anaesthesiology Combined Military Hospital, Multan Pakistan, from Aug 2020 to Feb 2021.

**Methodology:** One hundred women undergoing cesarean section under spinal anaesthesia from 18-45 years were included. Obstetric patients between 18-45 years of age, Non-labouring parturient, ASA Status I / II planned for Caesarean section were included. Patients were randomly divided into two treatment groups, i.e., Mechanical pump Group (Group M) and the Control Group (Group C), with Consecutive Non-probability sampling. The frequency of hypotensive symptoms, hypotension and bradycardia in both groups was noted.

**Results:** Frequency of hypotensive symptoms, hypotension and bradycardia in the compression stockings group was found in 18(36.0%), 8(16.0%) and 11(22.0%) patients while in 38(76.0%), 32(64.0%) and 30(60.0%) patients in the control group ( $p$ -value = 0.0001).

**Conclusion:** We concluded that the frequency of hypotensive symptoms, hypotension and bradycardia is less after lower limb compression stockings given to obstetric patients undergoing lower-segment cesarean section under spinal anaesthesia.

**Keywords:** Bradycardia, Hypotension, Spinal Anesthesia.

**How to Cite This Article:** Ali I, Iftikhar H, Rahman HU, Majeed K, Khalid U, Latif H. Effect of Lower Limb Compression Stockings on Hemodynamic Stability in Obstetric Patients undergoing Lower Segment Cesarean Section under Spinal Anaesthesia. *Pak Armed Forces Med J* 2023; 73(2): 456-459.

DOI: <https://doi.org/10.51253/pafmj.v73i2.8109>

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### INTRODUCTION

There are multiple factors for choosing anaesthesia for lower segment cesarean section (LSCS), including the indication of surgery, the obstetrician or patient's preference and the skills of the anaesthetist.<sup>1</sup> Regional anaesthesia has become the preferred technique because general anaesthesia is associated with higher problems for mothers. Mortality associated with general anaesthesia is mainly related to airway problems and aspiration pneumonitis. However, regional anaesthesia is rare and generally related to the excessive dermatomal spread of sympathetic blockade or local anaesthetic toxicity.<sup>2,3</sup>

However, spinal anaesthesia can induce several side effects, the most prevalent of which is a sudden decrease in blood pressure. The vasodilation caused by spinal block-induced sympatholytic induces this problem in moms. Placental and uterine circulation can be jeopardised due fall in blood pressure.<sup>4,5</sup>

However, in obstetric patients under spinal anaesthesia, certain factors increase the chances of hemodynamic instability.<sup>6</sup> Hypotension is the most common complication of spinal anaesthesia, mainly due to aortocaval compression and peripheral vasodilation secondary to hormonelinked vasodilation and sympathetic blockade. It occurs in 80-85% of pregnant women after spinal anaesthesia and presents with symptoms of nausea, vomiting or apprehension.<sup>7,8</sup> Pre-loading with crystalloids, use of inotropic agents (Ephedrine and phenylephrine etc.), prevention of aortocaval compression, use of compression stockings, and initial frequent blood pressure monitoring prevent hemodynamic instability. However, phenylephrine can cause maternal bradycardia, and other drugs also have adverse effects, while compression stockings are quite safe to use.<sup>9,10</sup>

This research was intended to show our experience with the effects of lower limb compression stockings in preventing spinal anaesthesia-induced hemodynamic instability during cesarean section in the local population.

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Received: 03 Feb 2022; revision received: 10 Jul 2022; accepted: 18 Jul 2022

## METHODOLOGY

The quasi-experimental study was conducted at the Department of Anesthesiology, Combined Military Hospital, Multan Pakistan, from August 2020 to February 2021. The sample size was calculated using the WHO calculator keeping the frequency of hypotension, i.e. 25.5% with M-Group and 60% with C-Group.<sup>11</sup> The study was started after permission from the Hospital Ethical Committee (13/Trg/2021).

**Inclusion Criteria:** Obstetric patients aged 18–45 years, non-labouring parturient, ASA Status I / II planned for Caesarean section were included in the study.

**Exclusion Criteria:** Patients with a history of psychiatric illnesses or on anti-psychotics medications, patients with multiple pregnancies, Valvular heart diseases or Ischemic heart diseases and pregnancy pathology (History of Gestational diabetes, Pregnancy induced hypertension or Eclampsia) and Obesity with body mass index (BMI) > 35 were excluded from the study.

One hundred patients who fulfilled the inclusion and exclusion criteria were admitted to an indoor facility from the outpatient department of Combined Military Hospital Multan. Informed written consent was obtained, and demographic information (age, Name, contact) was recorded. The consecutive non-probability sampling technique was used. Before reporting to the operation theatre, a detailed pre-anaesthesia assessment was carried out, and all essential laboratory investigations were collected. Patients were randomly divided into two treatment groups, i.e. Mechanical (M) and Control Group (C), with Consecutive Non-probability sampling.

In the operation theatre, patients were laid down at 15° left lateral position. Blood pressure, mean arterial pressure and heart rate were noted through the monitor and pre-hydration was done using 10ml/kg crystalloids. M-Group has sleeves applied to lower limbs. Continuous compression was started in M-Group patients. Elastic or graduated sequential compression stockings are applied to the lower limbs, which induce intermittent or continuous pressure to prevent venous pooling and increase blood flow toward central circulation. Lumbar puncture was done using a 25-G needle between the 3rd and 4th or fourth and fifth lumbar intervertebral space. All females received 10mg 0.5% Bupivacaine. Consequently, patients were placed supine with a 15° left lateral angle. The blood pressure of the patient was documented regularly; before delivery, at a one-minute interval, then at a three-

minute interval for ten minutes and five-minute intervals in the recovery room and at a ten-minute interval till she was discharged.

The APGAR score of the neonate was measured at 1 and 5 minutes. When hypotension was noted, it was managed by a staff nurse trained in anaesthesia. However, the staff nurse was unaware of the drug/protocol to control bias; ephedrine in 5mg increments as bolus was given intravenously until normalisation of blood pressure, and the fluid was administered simultaneously.

Statistical Package for Social Sciences (SPSS) version 22.0 was used for the data analysis. Quantitative variables were expressed as mean±SD and qualitative variables were expressed as frequency and percentages. Chi-square test was applied to find out the association. The *p*-value lower than or up to 0.05 was considered as significant.

## RESULTS

Out of 100 patients included in the study, the Results revealed a mean age of 28.78±4.51years. The mean age in Group-M was 28.12±4.34years, and in Group-C was 29.44±4.62 years. The mean height was 139.51±12.50cm. (Table-I)

**Table-I: Demographics of Patients (n=100)**

	Group-M	Group-C
	n(%)	
Age(years)	28.12±4.34	29.44±4.62
18-30	29(58.0%)	22(44.0%)
31-45	21(42.0%)	28(56.0%)
Height	140.52±12.88	138.50±12.16
≤150 cm	34(68.0%)	37(74.0%)
>150 cm	16(32.0%)	13(26.0%)
<b>Block height</b>		
3rd & 4th	21(42.0%)	19(38.0%)
4th & 5th	29(58.0%)	31(62.0%)
<b>ASA</b>		
I	29(58.0%)	27(54.0%)
II	21(42.0%)	23(46.0%)
<b>History</b>		
Yes	18(36.0%)	18(36.0%)
No	32(64.0%)	32(64.0%)
Systolic BP mmHg	128.94±3.63	104.42±2.75
Diastolic BP mmHg	82.74±3.69	73.94±3.12

Frequency of hypotensive symptoms, hypotension and bradycardia in the compression stockings group was found in 18(36.0%), 08(16.0%) and 11(22.0%) patients, while in 38(76.0%), 32(64.0%) and 30(60.0%) patients in the Control Group (*p*-value=0.01) (Table-II).

**Table-II Comparison of Outcome in both Groups (n=100)**

Outcome	Group-M		Group-C		p-value
	Yes n(%)	No n(%)	Yes n(%)	No n(%)	
Hypotensive symptoms	18 (36.0%)	32 (64.0%)	38 (76.0%)	12 (24.0%)	0.0001
Hypotension	08 (16.0%)	42 (84.0%)	32 (64.0%)	18 (36.0%)	0.0001
Bradycardia	11 (22.0%)	39 (78.0%)	30 (60.0%)	20 (40.0%)	0.0001

## DISCUSSION

Post-spinal hypotension is the most prevalent problem following spinal anaesthesia, which affects 60 percent to 70 percent of patients. Post-spinal hypotension has several definitions; the most commonly used implies lowering blood pressure by 1/5th of the normal value. Nausea and vomiting are common side effects. Post-spinal hypotension is a significant issue that, if not treated properly, can result in significant post-operative sequelae for the mother. Fetal problems range from a lower APGAR score to serious problems for the baby; oxygen deficiency, metabolic problems and neurological impairment.<sup>11,12</sup>

In this study, the frequency of hypotensive symptoms, hypotension and bradycardia in the compression stockings group was found in 18(36.0%), 8(16.0%) and 11(22.0%) mothers while in 38(76.0%), 32(64.0%) and 30(60.0%) mothers in the Control Group ( $p$ -value=0.0001). In a similar study, 76 mothers were assigned to the Mechanical (M) and Control (C) groups. Their results revealed hypotension in 25.5% and 60% of mothers in the experimental and control groups, respectively ( $p=001$ ). In this research work, it was revealed that there was a lower incidence of nausea and vomiting in the Experimental-Group as compared to the control one.

Moreover, in the United States, one study investigated "leg wrapping for the prevention of post-spinal hypotension in the caesarean section under spinal anaesthesia." They found that 60 percent of the control group experienced hypotension attacks, compared to just 10% in the experimental Group.<sup>13</sup> The Experimental Group had a consistently greater value of MAP throughout the surgery. Third, in Benha, Egypt, investigated the "use of lower leg compression technique for minimising spinal-induced hypotension and related hazards for mothers and newborns after caesarean birth" in Egyptian mothers. MAP, SBP, and DBP were significantly different in the two groups. They went on to say that lower leg compression had a bigger influence on MAP.<sup>14,15</sup>

Fourth, in Odisha, India, Das and Swain investigated the "impact of leg wrapping on hemodynamic and related problems in caesarean delivery" in Indian women. Hypotension was noted to be different among these groups. The incidence of hypotension was 13.33% in the leg-wrapped Group compared to 63.33% in the other Group. Finally, an Indian study looked at "hemodynamic changes following leg wrapping in elective caesarean delivery under spinal anaesthetic" in US mothers. Their study revealed a lower frequency of hypotension in the Experimental Group compared to the Control Group. MAP was substantially different among these groups at 4, 6, and 8-minutes after anaesthesia. Sixth, in Egypt, Khedr looked at "preventive strategies to minimise Post-spinal hypotension for elective caesarean surgery." In terms of MAP, they found a meaningful difference between these groups. Compared to the control group, the Experimental Group had higher MAP and reduced incidence of hypotension in the early and late post-operative period.<sup>16-18</sup>

## ACKNOWLEDGEMENTS

The Authors were highly obliged to Mr Abdul Rehman Ibrahim Bajwa for his valuable support.

## CONCLUSION

This study concluded that the frequency of hypotensive symptoms, hypotension and bradycardia is less after lower limb compression stockings in obstetric patients requiring surgery. So, lower limb compression stockings in patients during spinal anaesthesia should be used routinely in our general practice to prevent hypotension and bradycardia and manage patients undergoing spinal anaesthesia.

**Conflict of Interest:** None.

## Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

IA & HI: Data acquisition, critical review, approval of the final version to be published.

HUR & KM: Study design, drafting the manuscript, data interpretation, approval of the final version to be published.

UK & HL: Concept, data analysis, drafting the manuscript, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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## Lower Limb Compression Stockings

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