# Effect of lower leg compression application-during Cesarean Section-on women's physiological parameters and neonatal outcome.

**Amira Ahmed Ebrahim Elhawet, Assistant Lecturer**
*Obstetric and Gynecologic Nursing, Faculty of Nursing, Damnhour University*
**Shadia Ahmed Yassin, professor**
*Obstetric and Gynecologic Nursing, Faculty of Nursing, Alexandria University*
**Rasha Mohamed Essa, Professor**
*Obstetric and Gynecologic Nursing, Faculty of Nursing, Damnhour University*
**Ashraf Elsayed sharaf, Doctorate of Obstetrics and Gynecology**
*Obstetrics and Gynecology, Damanhour Medical National Institute*
**Hanan Abd El-Rahman Kandeel, Assistant professor**
*Obstetric and Gynecologic Nursing, Faculty of Nursing, Alexandria University*

***Abstract***

***Background:*** *Cesarean delivery is one of the most commonly performed operations all over the world. Spinal anesthesia is frequently accompanied by significant perinatal complications. Spinal induced hypotension is remarkably prevalent clinical issue attributed to spinal anesthesia. Consequently, numerous non-pharmacological techniques have been explored for its management and prevention. Leg compression therapy is a simple, effective and non-pharmacological technique that can be used to improve women's physiological parameters and neonatal outcome.* ***Objective:*** *to determine effect of lower leg compression application during cesarean section on women's physiological parameters and neonatal outcome.* ***Study design:*** *A nonrandomized controlled clinical trial, was followed in this study.* ***Settings:*** *research was carried out in the Damanhour Educational Hospital's cesarean birth room in Elbehira, Egypt.* ***Subjects:*** *A convenient sample of 100 women who meet inclusion criteria were selected from previously mentioned setting. The sample was divided into two equal groups (50 control group and 50 study group).****Tools:*** *to collect data three tools were employed, tool I: Socio-demographic, general and reproductive history interview schedule, tool II: Maternal physiological parameters and related signs assessment sheet and tool III: Neonatal outcome assessment sheet.* ***Results:*** *Regarding women's physiological parameters, there was a highly statistical significant difference among the two groups concerning heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure. Study and control groups exhibited a highly statistically significant difference regarding incidence of hypotension (14%, 58% respectively). In addition, there was a highly statistically significant difference in both groups considering oxygen saturation, APGAR score in 1$^{st}$ & 5$^{th}$ minute and admission to neonatal intensive care unit.* ***Conclusion:*** *Lower leg compression with elastic stocking during cesarean section is a simple, non-pharmacological and more effective approach to improve women's physiological parameters and newborn outcome.* ***Recommendations:*** *leg compression application throughout cesarean section need to be admitted in policies and regulations of maternity hospital for improving women's physiological parameters and neonatal outcome.*

**Keywords:** Lower leg compression, Cesarean Section, Physiological parameters, Neonatal outcome.

## *Introduction*

Cesarean delivery is often cited as the most common major surgical procedure worldwide. Cesarean section (CS) is a life-preserving operation in cases of particular pregnancy and labor problems (Abd El Wahab, 2021). Rate of CS continues to rise worldwide and currently accounts for more than 1 in 5 (21%) of all childbirths. The incidence of CS has increased significantly in Egypt. Internationally, Egypt ranked 1st among world countries with an estimated rate of cesarean section of 63% (World Health Organization, 2021).

Cesarean delivery requires effective anesthesia which can be regional (epidural or spinal) or a general anesthesia. Spinal anesthesia has been preferred over general anesthesia for cesarean section as it is simple, low risk, credible, secure and exposes the fetus to fewer drugs than general anesthesia (Fitzgerald et al., 2020; Choi, 2022).

Conversely, the negative impacts of spinal anesthesia include the potential for adverse drug reactions, hypotension, bradycardia, lightheadedness, nausea and vomiting as well as fetal acidosis. Additionally, it might result in fetal bradycardia and circulatory collapse in extreme circumstances (Thomson, Owen & Magowan, 2018).

Post spinal hypotension (PSH) is the most frequent adverse effect of spinal anesthesia. Based on estimates, PSH may occur up to 85% of throughout CS. It stands for reduction of blood pressure by 20% from the baseline (Šklebar, Bujas & Habek, 2019; Chekol, Melesse & Mersha, 2021).

A number of measures for prevention and treatment of post spinal hypotension are used in clinical practice, such as proper patient positioning, use of wedge below the right hip, preloading with intravenous fluids, use of vasopressors and wrapping of lower limbs with compression stockings or bandages (Ismail, Sohaib & Farrukh, 2020).

Leg compression with elastic stocking is a simple, effective and non-pharmacological technique that can be used to maintain women's physiological parameters during cesarean section (Abd Elati et al., 2020).

Maternity nurses play a significant role in assessing women's needs and preventing complications during cesarean birth. Also, the main task of nurse is to deliver necessary healthcare services to enhance well-being and mitigate any potential surgical complications. Thus, she should be competent in peri, intra and postoperative nursing care for women having cesarean sections (Abd Elati et al., 2020; Sung & Mahdy, 2023).

### *Aim of the Study*

**The study's aim is to:** determine the effect of lower leg compression application during cesarean section on women's physiological parameters and neonatal outcome.

### *Research hypothesis*

- Women who apply lower leg compression technique during cesarean section exhibit normal physiological parameters than the control group.
- Newborns of women who apply lower leg compression technique during cesarean section have normal APGAR score compared with the control group.

### *Operational definition:*

***Women's physiological parameters:*** in this study refers to measurement of heart rate, respiration, mean arterial pressure and peripheral oxygenation using noninvasive methods.

***Neonatal outcome:*** in this study refers to neonatal APGAR score at the 1st and 5th minute.

### *Materials and Method*

### *Materials*

***Design:*** A nonrandomized controlled clinical trial, was followed.

***Settings:*** Research was applied in cesarean delivery room of Damanhour Educational Hospital in Elbehira, Egypt.

***Subjects:*** A convenient sample of 100 women was selected from the previously mentioned setting. Utilizing Epi-info program, sample size was established based on the following aspects: population size = 300 over 3 months, expected frequency = 50%, acceptable error = 10%, confidence coefficient = 95% and minimal sample size = 90. Inclusion criteria are: age ranged from 20 to less than 35 years old, singleton pregnancy, normal pregnancy, full term, undergoing elective cesarean delivery with spinal anesthesia, free from history of leg deep venous thrombosis, body mass index less than 30 kg/m2 and willing to participate in the study.

***Tools:*** Three tools were utilized to gather data required for the study:

**Tool one: Socio-demographic, general and reproductive history interview schedule.**

**Part I**: Socio-demographic and general characteristics such as age, education, residence, occupation, weight, height, and BMI.

**Part II:** Reproductive history (gravidity, number of abortion, parity, gestational age, previous cesarean section, type of anesthesia and cause of present cesarean delivery).

**Tool two: Maternal physiological parameters and related signs assessment sheet:**

**It consisted of two main parts:**

**Part 1: Electronic monitoring of maternal physiological parameters:** this part was adopted from (Elgzar, Said &Ebrahim, 2019). It included the duration of operation, women's physiological measurements, and follow-up assessment sheet which contained evaluation of: heart rate, respiration, mean arterial pressure (MAP) and peripheral oxygenation.

**Part 2: Maternal related signs:** the researcher constructed this part after reviewing related literature to identify symptoms and indicators of maternal hypotension as nausea, vomiting, shivering, blurred vision, confusion and dizziness.

**Tool three: Neonatal outcome assessment sheet:** It included neonatal Apgar score: This tool was adopted from (Elgzar, Said &Ebrahim, 2019). It was used to record the neonatal Apgar score at the 1st and 5th minute.

***Method***

The Research Ethics Committee, Faculty of Nursing, Alexandria University approved to conduct the study. A panel of five specialists in obstetrics and gynecologic nursing tested the tool for content validity and their suggestions were performed. Tools' reliability was tested by Cronbach's Alpha Coefficient. The reliability result for the tool was 0.82 which is considered acceptable. 10 women participated in a pilot study to review the tools' clarity and applicability. Data was gathered during the period range from the beginning of July 2022 until the end of December 2022.

An informed consent was submitted from each woman. Tool I data was collected from both groups using interview schedule, which were done individually and privately. The researcher interviewed each woman to gather data of tool I for 10-15 min prior to operation in the waiting area. Routine preoperative intervention was administrated to women of both groups.

The mother's base line physiological parameters including: heart rate, respiration, means arterial pressure and peripheral oxygenation were recorded immediately before skin incision. A convenient sample of 100 women who meet inclusion criteria were selected from previously mentioned setting. The sample was divided into two equal groups (50 control group and 50 study group).

- Control group: included 50 women who received only the ordinary pre-operative intervention.

- Study group: compromised 50 women. Long elastic stocking (ordinary pressure 20-30 mmHg) was applied before spinal anesthesia till end of operation and removed before woman leaved CS room.

Different elastic stocking sizes (medium, large, and x-large) were utilized based on the appropriate size of woman's limbs. **Determine suitable size of *compression stockings* for each woman:** it was adopted from **Jobst Compression Stockings** by measuring the ankle and calf circumferences.

For both groups the physiological parameters including: heart rate, respiration, mean arterial pressure and peripheral oxygenation were recorded intra operatively every five min following spinal anesthesia till the end of the CS.

**For newborns** of the two groups, Apgar scores were additionally assessed immediately after delivery of the baby at the 1st and 5th minute using tool three(neonatal outcome assessment sheet).

**Ethical considerations:**

From each chosen subject a signed informed consent was submitted after description of research aim. Study participant's privacy was assured and respected. Confidentiality of data was guaranteed. Subject's right to take part or leave the study at any moment was emphasized.

***Statistical Analysis***

SPSS version 20 was utilized to organize, tabulate and analyze the collected data. Number and percentage were applied to describe qualitative data. Quantitative data were presented using range, mean and standard deviation. At the 5% level, significance of the results was determined.

***Results***

**Table 1** explains the number and percent distribution of the study subjects considering socio-demographic data. Table shows the mean age of the study and control groups was nearly identical (25.42 ± 3.73 and 25.82 ± 3.70) respectively. Across both groups, there was no statistically significant difference in terms of age, education, occupation, residence, or marital status, where p = (0.128, 0.420, 1.000, 0.373, 1.000) respectively. Meanwhile, the mean BMI of the study and control groups was 26.30 ± 2.67 & 25.38 ± 3.09 respectively. No statistically meaningful difference was observed between the study and control groups concerning body weight, height and body mass index, where p = (0.408, 0.147, 0.068) respectively.

**Table 2** clarifies the number and percent distribution of the study and control groups according to their reproductive history. It was found that 26% & 28% of study and control groups respectively had one cesarean section. The mean gestational age was almost equal (38.66 ± 0.96 & 38.74 ± 0.99) among the study and control groups respectively. No statistically significant difference was observed between both groups regarding their reproductive history.

**Table 3** presents comparison of heart rate (HR) change after spinal anesthesia in both studied groups. A highly statistically significant difference was identified in both groups from 5 min-40 min, where p= (0.001, <0.001, <0.001, <0.001, <0.001, <0.001, <0.001, 0.003) respectively.

**Figure 1** elaborates comparison among both groups considering incidence of hypotension. The figure shows that less than one-fifth (14%) of the study group had hypotension, while more than one-half (58%) of the control group had hypotension. Accordingly, highly statistically significant difference observed between both groups, where p= (<0.001).

**Figure 2** clarifies difference in both groups considering their maternal related signs of hypotension. Highly statistically significant difference was observed among both groups as regards nausea, vomiting and shivering, where p= (0.015, 0.038, 0.037).

**Table 4** presents comparison among both groups considering neonatal outcomes. Highly statistically significant difference was observed between the study and control groups in relation to oxygen saturation, APGAR score at 1st minute, APGAR score at 5th minute and admission to intensive care ,where p= (<0.001, 0.011, 0.027, 0.013).

***Discussion***

Cesarean section is an essential surgical intervention to preserve life of the mother and fetus where specific complications happened through pregnancy and labor. Spinal anesthesia considered the method of choice for cesarean section, as it avoids the risks associated with general anesthesia. However, it may potentially have some undesirable effects. Spinal induced hypotension is the prevailing outcome following spinal anesthesia throughout cesarean- S. PSH is linked to maternal and fetal complications. So, several non-pharmacological modalities have been investigated for its prevention and management. Leg compression therapy is a simple, effective and non-pharmacological technique that can be used to maintain women's physiological parameters during cesarean section (Joshi et al., 2018; Herbosa et al., 2022).

Discussion will be elaborated upon four principal categories: maternal physiological parameters, incidence of hypotension, maternal signs of hypotension and neonatal outcome.

The current study exhibited that there wasn't significant difference was found in both groups considering socio-demographic characteristics. The study subjects' consistent profile helped to restrict the influence of external variables that might confuse the effect of the targeted intervention (leg compression application).

Regarding women's **physiological parameters**, the current study showed highly significant difference among the groups concerning heart rate from 5 min to 40 min. The control group exhibited a greater heart rate when compared to the intervention group. These finding may be due to that heart rate increases in response to hypotension (Sullivan, 2021).

This finding is consistent with Das & Swain (2016) demonstrated significant increase in heart rate in control group compared to other group through intraoperative monitoring at 4min-15 minutes with more significant at 6th minute-10th minute due to a systolic blood pressure was significantly decreased in control group than the other group consequently hypotension causes an increase in heart rate.

In contrast, this finding is opposite to Kuhn et al. (2016) indicated that HR was significantly decreased among phenylephrine group compared with leg wrapped group. Disparity among both researches is could be explained by the fact that the pharmacologic impact of phenylephrine which generates a systemic vasopressor response, subsequently leading to a decrease in heart rate. Leg compression is a simple nursing action that can't be compared with medications, which have systemic impact (Richards, Lopez & Maani, 2023).

Regarding **incidence of hypotension**, the study results illustrated a highly statistically significant difference among both groups considering post spinal hypotension incidence, where p= (<0.001).The current results are also in accordance with Bagle et al. (2017) discovered that wrapping the lower limbs soon before spinal anesthesia is a useful technique to decrease frequency of severe hypotension episodes. Consequently, they reported that the incidence of hypotension exhibited in 60% of control group versus only 10% of women who received leg wrapping.

Also, recent results are in harmony with research implemented by Sadati et al. (2018) highlighted that mean blood pressure differed significantly at different times after spinal anesthesia in study and control groups. In other meaning, hypotension occurrence appeared more frequent in control group.

Regarding **signs accompanied with hypotension,** present research added both

**nausea and vomiting** were greatly found among women at the control group. These findings correspond to Manouchehrian et al. (2020) demonstrated the incidence rate of intraoperative nausea and vomiting were markedly decreased in leg compression women compared to other group.

In contrast, same finding is inconsistent with the findings of Zasa et al. (2015) demonstrated nausea and vomiting occurrence was not statistically significant different in both groups (p = .228). The discrepancy between previous study findings and the current study are most likely attributable to differences in research methods.

Regarding **neonatal outcome**, as assessed by Apgar scores, the current study pointed out a highly statistically significant difference among both groups considering the Apgar score in first and five minute. Present research adheres to conclusions of Prajith et al. (2021), added meaningful difference in Apgar within 1 and 5 min among the groups. They stated study group's newborn exhibited a greater Apgar score.

On the other hand, the present findings relatively don't harmonize with Javaherforooshzadeh et al., (2020) concluded newborn's Apgar score within first and five minute were not significantly different across the groups.

Concerning **admission to intensive care**, the current outcomes revealed there was a highly statistically significant difference among both groups as regards neonatal admission to intensive neonatal care unit. Furthermore, the current conclusions are identical to Abdelati et al. (2018) found significant difference between the study and control groups neonates concerning their admission to intensive neonatal care unit. On the other side, the same findings are inconsistent with the findings of El-Shora & El-Nemer (2020), who noted that no meaningful difference was identified in the groups regarding NICU admission.

## *Conclusion*

In light of recent study results, it can be concluded that, application of leg compression with elastic stocking during cesarean section just before spinal anesthesia is useful to improve women's physiological parameters and neonatal outcome. It is cheap, easy, available, non-invasive, and non-pharmacological method to decrease incidence of spinal induced hypotension and its subsequent harmful effect on the mother and fetus.

### *Recommendations*

*On the basis of recent study results, the following recommendations are suggested:*

- Leg compression ought to be employed as a crucial component of perioperative care and can be complemented with booklets and brochures.
- Application of leg compression throughout CS needs to be incorporated into policies and regulations of maternal hospital for improving women's physiological parameters and neonatal outcome.
- Replicate present research upon a larger population and various setting to generalize the findings.

**Table (1): Comparison between the two studied groups according to Socio-demographic and general history**

| Socio-demographic and General history | Leg compression (n = 50) | | Control (n = 50) | | Test of Sig. | p |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | | |
| **Age (Years)** | | | | | | |
| 20 – <25 | 24 | 48.0 | 17 | 34.0 | $\chi^2$= 4.105 | 0.128 |
| 25 – <30 | 16 | 32.0 | 26 | 52.0 | | |
| 30 – <35 | 10 | 20.0 | 7 | 14.0 | | |
| Mean ± SD. | 25.42 ± 3.73 | | 25.82 ± 3.70 | | t= 0.539 | 0.591 |
| **Education** | | | | | | |
| Illiterate or read & write | 5 | 10.0 | 7 | 14.0 | $\chi^2$= 3.896 | 0.420 |
| Primary | 9 | 18.0 | 4 | 8.0 | | |
| Preparatory | 18 | 36.0 | 20 | 40.0 | | |
| Secondary | 13 | 26.0 | 10 | 20.0 | | |
| University or high | 5 | 10.0 | 9 | 18.0 | | |
| **Occupation** | | | | | | |
| Housewife | 38 | 76.0 | 38 | 76.0 | $\chi^2$= 0.000 | 1.000 |
| Working | 12 | 24.0 | 12 | 24.0 | | |
| **Residence** | | | | | | |
| Rural | 38 | 76.0 | 34 | 68.0 | $\chi^2$= 0.794 | 0.373 |
| Urban | 12 | 24.0 | 16 | 32.0 | | |
| **Weight (Kg) (Mean ± SD.)** | 74.44 ± 8.07 | | 73.18 ± 7.06 | | t= 0.831 | 0.408 |
| **Height (cms) (Mean ± SD.)** | 168.3 ± 4.96 | | 170.3 ± 8.28 | | t= 1.465 | 0.147 |
| **BMI (Kg/m$^2$)** | | | | | | |
| Normal (18.5-24.9) | 9 | 18.0 | 17 | 34.0 | $\chi^2$= 3.326 | 0.068 |
| Overweight (25-29.9) | 41 | 82.0 | 33 | 66.0 | | |
| Mean ± SD. | 26.30 ± 2.67 | | 25.38 ± 3.09 | | t=1.601 | 0.113 |

SD: **Standard deviation** **t: Student t-test** $\chi^2$: **Chi square test**
p: p value for comparing between the two studied groups
*: Statistically significant at $p \leq 0.05$

**Table (2): Comparison between the two studied groups according to Reproductive history**

| Reproductive history | Leg compression (n = 50) | | Control (n = 50) | | Test of Sig. | P |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | | |
| **Gravidity** | | | | | | |
| Once | 20 | 40.0 | 14 | 28.0 | $\chi^2$= 5.087 | 0.079 |
| Twice | 16 | 32.0 | 11 | 22.0 | | |
| 3 times or more | 14 | 28.0 | 25 | 50.0 | | |
| **Parity** | | | | | | |
| Not applicable | 22 | 44.0 | 16 | 32.0 | $\chi^2$= 3.306 | $^{MC}$p= 0.341 |
| Once | 15 | 30.0 | 13 | 26.0 | | |
| Twice | 12 | 24.0 | 20 | 40.0 | | |
| 3 times or more | 1 | 2.0 | 1 | 2.0 | | |
| **Type of previous delivery** | | | | | | |
| Not applicable | 22 | 44.0 | 16 | 32.0 | $\chi^2$= 1.546 | 0.462 |
| Normal delivery | 7 | 14.0 | 8 | 16.0 | | |
| Cesarean section | 21 | 42.0 | 26 | 52.0 | | |
| **No. of previous CS** | | | | | | |
| Not applicable | 26 | 52.0 | 22 | 44.0 | $\chi^2$= 1.390 | $^{MC}$p= 0.777 |
| Once | 13 | 26.0 | 14 | 28.0 | | |
| Twice | 10 | 20.0 | 11 | 22.0 | | |
| 3 times or more | 1 | 2.0 | 3 | 6.0 | | |
| **Gestational age (Mean ± SD.)** | 38.66 ± 0.96 | | 38.74 ± 0.99 | | t= 0.411 | 0.682 |
| **Reason of current CS** | | | | | | |
| Cephalo-pelvic disproportion | 5 | 10.0 | 6 | 12.0 | $\chi^2$= 7.079 | 0.294 |
| Dystocia/failed induction | 5 | 10.0 | 12 | 24.0 | | |
| Abnormal presentation | 8 | 16.0 | 6 | 12.0 | | |
| Previous cesarean section | 13 | 26.0 | 16 | 32.0 | | |
| **Others** | | | | | | |
| Maternal request | 15 | 30.0 | 9 | 18.0 | | |
| Oligohydrominus | 2 | 4.0 | 0 | 0.0 | | |
| Large baby | 2 | 4.0 | 1 | 2.0 | | |

SD: **Standard deviation** **t: Student t-test** $\chi^2$: **Chi square test** MC: **Monte Carlo**
p: p value for comparing between the two studied groups
*: Statistically significant at $p \leq 0.05$

**Table (3): Comparison of Heart rate (HR) change after spinal anesthesia in both studied groups**

| Time (min.) | Leg compression | Control | Test of Sig. | P |
|---|---|---|---|---|
| **5 min.** Mean ± SD. | **(n = 50)** 90.30 ± 12.87 | **(n = 50)** 102.3 ± 12.46 | t=4.737* | 0.001* |
| **10 min.** Mean ± SD. | **(n = 50)** 87.30 ± 11.48 | **(n = 50)** 104.44 ± 15.79 | t=6.209* | <0.001* |
| **15 min.** Mean ± SD. | **(n = 50)** 88.76 ± 13.06 | **(n = 50)** 104.86 ± 12.97 | t=6.185* | <0.001* |
| **20 min.** Mean ± SD. | **(n = 50)** 88.68 ± 10.94 | **(n = 50)** 103.94 ± 7.15 | t=8.256* | <0.001* |
| **25 min.** Mean ± SD. | **(n = 50)** 88.26 ± 8.85 | **(n = 50)** 106.06 ± 9.40 | t=9.746* | <0.001* |
| **30 min.** Mean ± SD. | **(n = 50)** 86.92 ± 7.14 | **(n = 50)** 109.86 ± 13.24 | t=10.785* | <0.001* |
| **35 min.** Mean ± SD. | **(n = 50)** 84.62 ± 7.81 | **(n = 50)** 109.18 ± 15.03 | t=10.254* | <0.001* |
| **40 min.** Mean ± SD. | **(n = 50)** 104.96 ± 8.22 | **(n = 50)** 112.16 ± 14.63 | t=3.034* | 0.003* |
| **45 min.** Mean ± SD. | **(n = 47)** 103.0 ± 8.68 | **(n = 50)** 99.86 ± 25.39 | t=0.825 | 0.413 |
| **50 min.** Mean ± SD. | **(n = 28)** 101.79 ± 10.72 | **(n = 41)** 99.98 ± 26.25 | t=0.396 | 0.694 |
| **55 min.** Mean ± SD. | **(n = 17)** 104.65 ± 11.88 | **(n = 29)** 110.31 ± 12.52 | t=1.509 | 0.139 |
| **60 min.** Mean ± SD. | **(n = 5)** 98.0 ± 9.64 | **(n = 18)** 112.2 ± 14.47 | t=2.048 | 0.053 |

SD: **Standard deviation** **t: Student t-test**
p: p value for comparing between the two studied groups
*: Statistically significant at $p \leq 0.05$

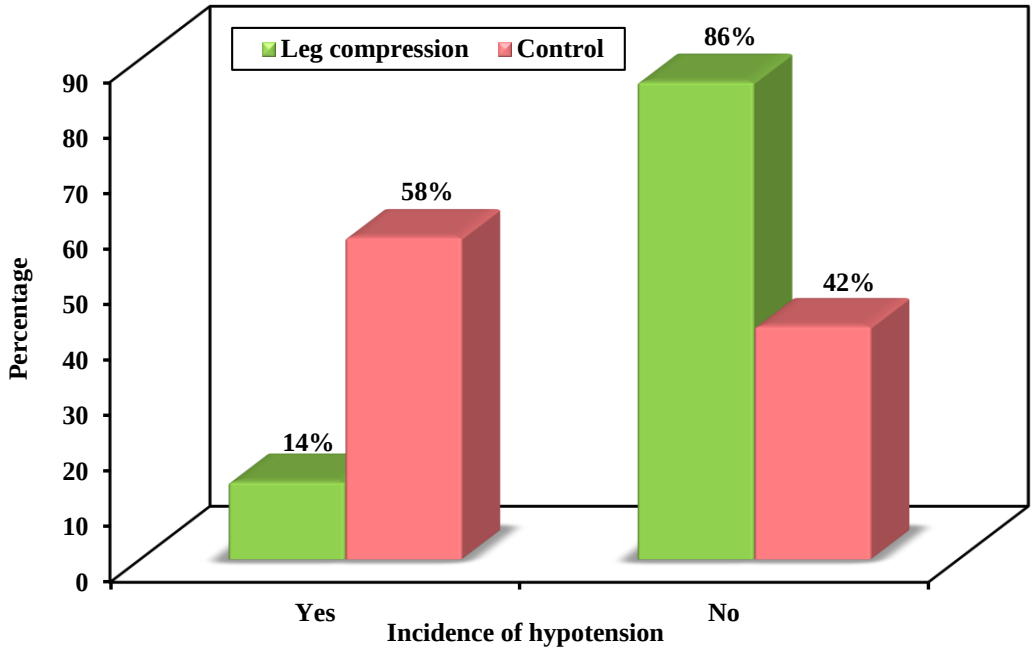


**Figure (1): Comparison between the two studied groups according to incidence of hypotension**

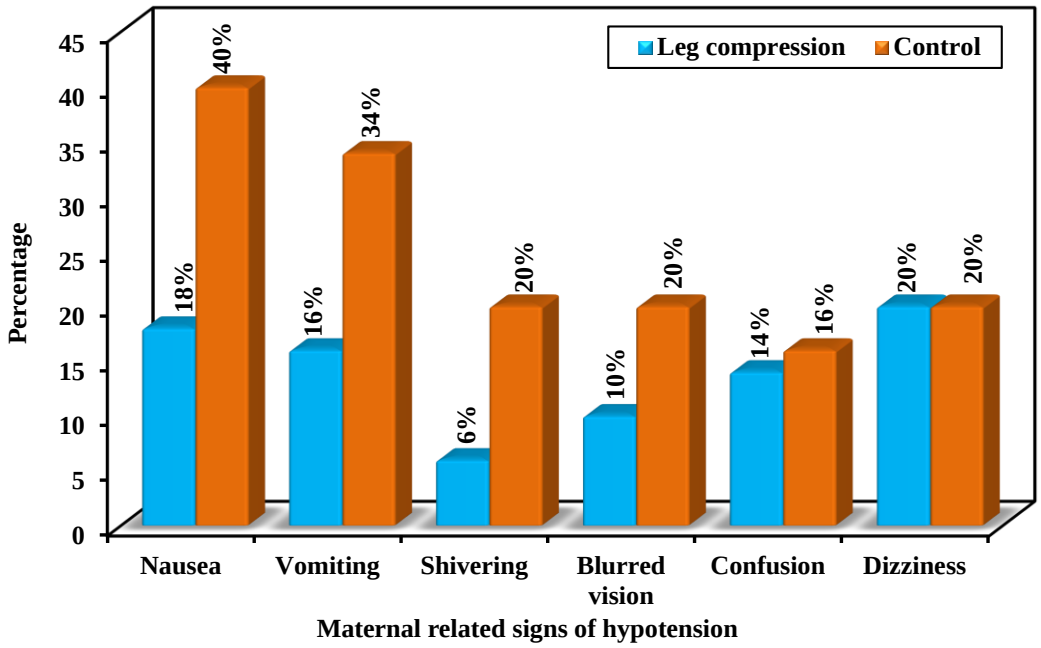


**Figure (2): Comparison between the two studied groups according to their maternal related signs of hypotension**

**Table (4): Comparison between the two studied groups according to neonatal outcomes**

| Neonatal outcomes | Leg compression (n = 50) | | Control (n = 50) | | Test of Sig. | P |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | | |
| **Temperature** | 36.94 ± 0.47 | | 36.75 ± 0.62 | | t=1.702 | 0.092 |
| **Oxygen saturation** | 99.38 ± 0.85 | | 97.98 ± 1.35 | | t=6.204* | <0.001* |
| **APGAR at 1st minute** | | | | | | |
| Normal (7– 10) | 37 | 74.0 | 25 | 50.0 | $\chi^2$= 2.729 | MCp= 0.208 |
| Moderate risk (4 – 6) | 13 | 26.0 | 25 | 50.0 | | |
| High risk (0 – 3) | 0 | 0.0 | 0 | 0.0 | | |
| Mean ± SD. | 97.0 ± 100.0 | | 93.0 ± 100.0 | | t=2.60* | 0.011* |
| **APGAR at 5th minute** | | | | | | |
| Normal (7– 10) | 46 | 92.0 | 35 | 70.0 | $\chi^2$= 7.862* | 0.005* |
| Moderate risk (4 – 6) | 4 | 8.0 | 15 | 30.0 | | |
| High risk (0 – 3) | 0 | 0.0 | 0 | 0.0 | | |
| Mean ± SD. | 8.92 ± 1.44 | | 8.12 ± 2.07 | | t=2.246* | 0.027* |
| **Baby needs resuscitation** | | | | | | |
| Yes | 0 | 0.0 | 2 | 4.0 | $\chi^2$= 2.041 | FEp= 0.495 |
| No | 50 | 100.0 | 48 | 96.0 | | |
| **Baby needs oxygen** | | | | | | |
| Yes | 19 | 38.0 | 28 | 56.0 | $\chi^2$= 3.252 | 0.071 |
| No | 31 | 62.0 | 22 | 44.0 | | |
| **Admission to intensive care** | | | | | | |
| Yes | 13 | 26.0 | 25 | 50.0 | $\chi^2$= 6.112* | 0.013* |
| No | 37 | 74.0 | 25 | 50.0 | | |
| **If yes reasons for admission to ICU** | **n=13** | | **n=25** | | | |
| Low APGAR score | 3 | 23.1 | 8 | 32.0 | $\chi^2$= 1.847 | MCp= 0.622 |
| Low birth weight | 3 | 23.1 | 5 | 20.0 | | |
| Preterm | 0 | 0.0 | 0 | 0.0 | | |
| Birth asphyxia | 1 | 7.7 | 5 | 20.0 | | |
| Respiratory distress syndrome | 6 | 46.2 | 7 | 28.0 | | |

SD: **Standard deviation** **t: Student t-test**
$\chi^2$: **Chi square test** MC: **Monte Carlo** FE**: Fisher Exact**
p: p value for comparing between the two studied groups
*: Statistically significant at $p \leq 0.05$

## *References*


- Abd El Wahab, I. S. (2021). Trends of cesarean sections done at Ain Shams University Maternity Hospital from 2012 to 2018 (Master Thesis). Faculty of Medicine: Ain Shams University.
- Abd Elati, I.H., Elshahat, M.N., Ali, M.R., & Rashad, A.H. (2020). Effectiveness of lower leg compression maneuver in reducing spinal anesthesia induced hypotension for women undergoing cesarean section. Port Said Scientific Journal of Nursing, 7(4), 243-271. https://doi.org/10.21608/pssjn.2020.132006
- Abdelati, I., Elshabory, N., Elzeblawy, H., Gaballah, S., & Nassar, H. M. (2018). Prophylactic legs compression for reducing hypotension and fetal acidosis as subsequent for spinal anesthesia in cesarean delivery. IOSR Journal of Nursing and Health Science (IOSR-JNHS), 7(1), 35-42. https://doi. org/10. 9790/ 1959-0701063542.
- Bagle, A. A., Vishnu, A., Kumar, A., Malik, A., Garg, V., & Khanvilkar, G. (2017). Evaluation of Leg wrapping for the prevention of postspinal hypotension in cesarean section under spinal anesthesia. Anesthesia, Essays and Researches, 11(2), 439-443. https:// doi.org/ 10.4103/ 0259-1162.194564.
- Chekol, W. B., Melesse, D. Y., & Mersha, A. T. (2021). Incidence and factors associated with hypotension in emergency patients that underwent cesarean section with spinal anesthesia: Prospective observational study. International Journal of Surgery Open, 35, 100378. https:// doi. org/ 10. 1016/ j.ijso. 2021.100378.
- Choi, S. U. (2022). General anesthesia for cesarean section: are we doing it well? Anesthesia and Pain Medicine, 17(3), 256-261. https://doi.org/10.17085/apm.22196.
- Das, P., & Swain, S. (2016). Effect of leg wrapping on hemodynamics and associated complications in caesarean section: a randomized prospective study. International Journal of Research in Medical Sciences, 4(10), 4408-4415. https://doi.org/10.18203/2320 6012.ijrms20163302.
- Elgzar, W. T. I., Said, H., & Ebrahim, H. A. (2019). Effect of lower leg compression during cesarean section on post-spinal hypotension and neonatal hemodynamic parameters: nonrandomized controlled clinical trial. International Journal of Nursing Sciences, 6(3), 252–258. https://doi.org/10.1016/j.ijnss.2019.06.003.
- El-Shora, S.N., & El-Nemer, A.M. (2020). Effect of leg wrapping technique on prevention of spinal induced hypotension and fetal acidosis during cesarean section: Randomized controlled trial. Journal of Nursing Education and Practice, 10(2). http://jnep.sciedupress.com.
- Fitzgerald, J. P., Fedoruk, K. A., Jadin, S. M., Carvalho, B., & Halpern, S. H. (2020). Prevention of hypotension after spinal anaesthesia for caesarean section: a systematic review and network meta-analysis of randomised controlled trials. Anaesthesia, 75(1), 109-121. https://doi.org/10.1111/anae.14841.
- Herbosa, G. A. B., Tho, N. N., Gapay, A. A., Lorsomradee, S., & Thang, C. Q. (2022). Consensus on the Southeast Asian management of hypotension using vasopressors and adjunct modalities during cesarean section under spinal anesthesia. Journal of Anesthesia, Analgesia and Critical Care, 2(1), 56. https:// doi. org/ 10.1186/ s44158-022-00084-1.
- Ismail, S., Sohaib, M., & Farrukh, F. (2020). Management of spinal-induced hypotension for elective caesarean section: A survey of practices among anesthesiologists from a developing country. African Health Sciences, 20(4), 1918–1926. https://doi.org/10.4314/ahs.v20i4.50.
- Javaherforooshzadeh, F., Pipelzadeh, M. R., Akhondzadeh, R., Adarvishi, S., & Alghozat, M. (2020). Effect of sequential compression device on hemodynamic changes after spinal anesthesia for caesarean section: a randomized controlled trial. Anesthesiology and Pain Medicine, 10(5), e104705. https://doi.org/10.5812/aapm.104705.
- Joshi, M., Raghu, K., Rajaram, G., Narang, N., Kumar, S., & Singh, A. P. (2018). Baseline heart rate as a predictor of post-spinal hypotension in patients undergoing a caesarean section: An observational study. Journal of Obstetric Anesthesia and Critical Care, 8(1), 20-3. https://doi.org/10.4103/joacc.joacc_56_17.
- Kuhn, J. C., Hauge, T. H., Rosseland, L. A., Dahl, V., & Langesæter, E. (2016). Hemodynamics of phenylephrine infusion versus lower extremity compression during spinal anesthesia for cesarean delivery: a randomized, double-blind, placebo-controlled study. Anesthesia and Analgesia, 122(4), 1120–1129. https:// doi. org/ 10.1213/ ANE. 0000000000001174.

- Manouchehrian, N., Davoudi, M., Bkhshaei, M. H., Jiryaee, N., Salehinejhad, A., & Faryadras, M. (2020). Evaluation of leg wrapping with elastic bandage for the prevention of post spinal hypotension in cesarean section. Avicenna Journal of Clinical Medicine, 27(2), 69–76. https://doi.org/10.29252/ajcm.27.2.69.
- Prajith, K. R., Mishra, G., Ravishankar, M., & Hemanth Kumar, V. R. (2020). Hemodynamic changes under spinal anesthesia after elastic wrapping or pneumatic compression of lower limbs in elective cesarean section: A randomized control trial. Journal of Anesthesiology, Clinical Pharmacology, 36(2), 244–250. https://doi.org/10.4103/joacp.JOACP_72_18
- Richards, E., Lopez, M. J., & Maani, C. V. (2023). Phenylephrine. StatPearls Publishing.
- Sadati, L., Mashak, B., Arasteh, M., Khaneghah, Z., Asl, M., & Salehi, T. (2018). Effect of wearing compression socks on hypotension and the amount of ephedrine administration after spinal anesthesia in candidates for cesarean section. Journal Clinical and Basic Research, 2(3), 10-18.
- Šklebar, I., Bujas, T., & Habek, D. (2019). Spinal anesthesia-induced hypotension in obstetrics: prevention and therapy. Acta Clinica Croatica, 58 (Suppl 1), 90–95. https://doi.org/10.20471/acc.2019.58.s1.13.
- Sullivan, D. (2021). What to know about low blood pressure with a high pulse. Available from: https:// www. medicalnewstoday. com/articles/ low-blood-pressure-high-pulse. [Accessed in: Jan, 2023].
- Sung, S., & Mahdy, H. (2023). Cesarean section. StatPearls Publishing.
- Thomson, A.,Owen, P., & Magowan, B. (2018). Clinical Obstetrics & Gynecology (4th ed.). Elsevier Saunders.
- World Health Organization [WHO]. (2021). Cesarean section rates continue to rise, amid growing inequalities in access. WHO.
- Zasa, M., Conci, E., Marchignoli, A., Pini, R., Passeri, L., Fanelli, G., & Cornini, A. (2015). Comparison of two different approaches to hypotension following spinal anesthesia for Caesarean delivery: effects on neonatal and maternal wellbeing. Acta Biomedica, 86(1), 45–52.