

Prophylactic Legs Compression for Reducing Hypotension and Fetal Acidosis as Subsequent For Spinal Anesthesia in Cesarean Delivery

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Background: Spinal block gives admirable and excellent anesthesia for cesarean delivery, but it is frequently accompanied by hypotension, which if untreated can pose serious risks to mother and baby. Strategies directed to increasing venous return, such as lifting or mechanically compressing the lower extremities, and aggressive intravascular volume loading are very effective in the treatment of arterial hypotension. **This study aims** to examine leg compression for decreasing maternal hypotension and fetal acidosis subsequent spinal anesthesia in cesarean delivery. **A Quasi-experimental design used. Setting:** The research was accomplished at cesarean delivery operating unit, Al-Azhar University Hospital throughout the period from January 2017 to June 2017. **Sample:** A total of 250 full-term parturients with an uncomplicated pregnancy undergone planned cesarean delivery using spinal anesthesia were recruited in both leg compression group (group A) and control group (group B). A or B were randomly allocated (125 in each one group) to have their compression of leg with socks. Protocol of pre-hydration and anesthetic technique standardized was followed. **Tools:** Three tools were used for collecting the necessary data, structured interviewing questionnaire sheet, maternal record, and neonatal assessment sheet. **Results:** Hypotension was significantly less ($P = 0.001$) in Group A (leg compression group) patients when compared with Group B (non-leg compression) a highly statistical significant difference ($P = 0.001$) was acquired between group managed by leg compression and non-legs compression group considering mean arterial pressure and newly born (neonatal) acidosis. **Conclusion:** Incidence of hypotension can be reduced by legs compression with socks. Since legs compression with socks is easy, noninvasive, available, and no pharmacological method, **Recommendations:** leg compression during cesarean can be recommended for preventing post spinal hypotension

Keywords: Cesarean Delivery, Leg Compression, Hypotension, Spinal Hypotension, Nursing.

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I. Introduction

Spinal anesthesia (SA) considered as the best frequent anesthetic type used in caesarean section delivery patients. Evade complications and risks of general anesthesia also, enhances successful pain relief postoperatively are the common advantages for using SA during caesarean delivery. Hypotension and tachycardia are the most prevalent side effects of SA. The prevalence of hypotension with SA during caesarean delivery (CD) is valued to be 80% which is high^(1,2).

All women during CD monitored by noninvasive blood pressure, pulse oximeter, and electrocardiography to get hemodynamic measurements as Mean Arterial Pressure (MAP) is reflects changes in the relationship between cardiac output (CO) and systemic vascular resistance (SVR) and reflects the arterial pressure in the vessels perfusing the organs.⁽²⁻⁴⁾

In pregnant woman, aortocaval compression leads to decreases in both venous return and cardiac output (CO)⁽³⁾. Additionally, spinal anesthesia causing a reduction in systemic vascular resistance (SVR) that leads to hypotension which is physiologically balanced and compensated by an increase in cardiac output. However, a high level of spinal block can inhibit the cardio accelerator fibers leading to a fall in the heart rate and hence the cardiac output. Thereby, instead of CO compensation, it's usually decreases. The combined effect of aortocaval compression, decreased cardiac output and SVR accounts for the high incidence of hypotension (well-defined as both SBP < 100/mmHg or diminished SBP by 20% from the baseline reading interpretation) or

mean arterial pressure <65/ mmHg) after SA⁽⁴⁾. As a consequence, prolonged maternal hypotension causing a detrimental effect to the fetus as it could worsen the fetal Apgar scores; extend fetal acidosis and the time to sustained maintenance respiration. For the mother, it's frequently associated with maternal nausea and vomiting. However, severe SA hypotension can lead to serious complications to the mother such as loss of consciousness and to the fetus as hypoxia and brain damage. So that, avoiding hypotension amid spinal anesthesia for cesarean segment has been alluded as "Sacred Grail" in obstetric^(5,6).

About 90% of venous return from the legs is through the action of the muscle pumps and the negative pressure produced in the thorax during inhalation aids venous return to the heart. Blood in the lower limb veins is squeezed upwards by the contraction of the surrounding thigh, calf and foot muscles. Venous valves prevent backward flow of blood when the muscles relax during anesthesia. Thereby, external compression using leg compression (LC) establishes an increase in venous return by translocation of blood from lower extremities to the thorax. Thus, LC leads to increased stroke volume (SV) and consequently cardiac output (CO)⁽⁷⁾.

Numerous measures have been experienced to avoid spinal induced hypotension. Limited measures were partially useful and effective as pre-loading colloid fluid, co-loading of crystalloid, vasopressors, and compression of lower limb⁽⁶⁻⁸⁾. Moreover, several interventions reduced the incidence of hypotension, but no single technique could effectively abolish hypotension⁽⁹⁾. The proofed evidence for a possible task for LC in inhibition of PSH is vibrant. So that, we examined the efficacy of LC during CD done after spinal block as prophylaxis of (PSH).

Aim of this study:

To examine prophylactic legs compression for decreasing hypotension and fetal acidosis as subsequent for spinal anesthesia in cesarean section delivery

Hypothesis:

Compression of legs during cesarean section delivery expected to lessen and reduce motherly hypotension and reduce neonatal acidosis.

II. Methodology

2.1 Research design:

This study carried out using a quasi- experimental (Control group & Intervention group).

Study setting:

The present paper research was carried out at operating room, cesarean delivery next to obstetrical and gynecological department linked to Azhar University Hospital, Damietta city, Egypt. This is a governmental health agency providing outpatient and inpatient obstetrical, gynecological and child care services. It was chosen because it attracts women from all nearby areas and provides free cost health services for women during pregnancy time. Where there are two CD operating rooms.

Study Population and Sample:

The study was completed from the beginning of January, 2017 till the end of June; 2017. All ethical issues were taken into consideration during all phases of the study: the researchers maintained an anonymity and confidentiality of the subjects. The researcher introduced herself to the women and briefly explained the nature and aim of the study to every woman before participation and women were assured that the study maneuver will cause no actual or potential harm to her. Also, they were assured that professional help will be provided for her even if she decided to withdraw from the study of whenever needed. Women were also assured that the information obtained during the study will be confidential and used for the research purpose only. On paper informed agreements consents were gotten from participant's previous inclusion.

Mothers were randomly divided into two groups: Group B; the control group, non -legs compression who receive routine hospital care during CD. Group A; the study group, who received prophylactic legs compression care. Members were full term (between 39 weeks and 40 weeks 6 days) singleton parturient matured in the vicinity of 18 and 39 years booked for CS under the spinal blocking. Avoidance criteria were hypertensive issue of pregnancy, cardiovascular disorders, weight record (BMI) over 30 kg/m², ladies with history of profound venous thrombosis of their lower appendages, ladies with shallow thrombophlebitis of their legs, ladies with hypersensitive response created to the neighborhood soporific some time recently, ladies with crisis cesarean segment, ladies who had contraindications for spinal anesthesia, patients with pattern hypotension (systolic circulatory strain (SBP) < 100 mmHg) or antepartum draining was likewise excluded.

Sample estimation size:-

The calculation of sample was according the following equation

$$N = \frac{2Pq (ZQ \sqrt{2} + ZB)^2}{(P1 + P2)^2}$$

Where:-

N = Sample size

P = (P1 + P2) /2

Q = 1- P

Z Q = 1.96

Z B = 0.84

As a result, 112 women per each group were estimated. After adjustment for dropout rate of 10%, the sample size was increased to 125 women per group. The total sample size were 250 mothers estimated to detect difference between rates for postoperative complication for woman undergoing CS in the control group (P1=25%) and the expected rate in the intervention group (P2= 10%) by a 95% level of confidence (& error = 5 %) and a study power of 80% (B error = 20 %) using the equation for the differences between two proportions (*Schlesselman , 1982*).⁽¹⁰⁾

Tools

Tools were utilized for information gathering:

.An Interviewing Questionnaire:

It was created by the researchers; it was utilized to gather demographic data for example; age, residence, educational level, mother weight, height, and age of gestationaland so on.

. Record of maternal hemodynamic and signs of hypotension:

Used to record patient's hemodynamic data (Physiological dimensions measurements were completed using automated machines), and maternal hypotension signs (such as nausea, vomiting)

. Assessment sheet Neonates:

Used by the researchers to assess pH of umbilical arterial & venous blood, and 1 and 5th minute Apgar score.

Tool validity and Reliability

Tools were reviewed by a panel of 5 experts in the field of Obstetrics and Gynecological Medicine and Medical Surgical Nursing faculty staff to test its content validity. It involved the views of the expert's specialists for all item were recorded on a 2 point scale: relevant, norelevant and clear, no clear and general or total opinion about the document form.

Experts were demanded to say their opinion and observations on the tool and offer any suggestion for addition or omissions of items. Then necessary corrections were made. Modifications were done accordingly based on their judgment. Reliability was done by Cronbach's Alpha coefficient test which revealed that each item of the utilized tools consisted relatively homogeneous items. Statistical significance considered at p-value ≤0.05. In addition two months needed for necessary modifications.

Pilot:

This done on 10% of studied mothers'. Its purpose was to test the simplicity clearance, feasible possibility and applicability of the tools and whether it was understandable, and to determine the time needed to fill the tool. The tool was filled and collected by the researchers. The time needed for completion of the questionnaire sheet. These groups of women were excluded from the study sample.

2.5 Field of work:

All sample gotten 500 ml of lactated ringer as a preloading liquid, and after that, every one of the patients got SA at levels between L4-L5 or L3-L4 inter-spaces. All ladies were cannulated in the left antecubital vein with 16G intravenous catheters (cannula), and checked by noninvasive circulatory strain (pressure), beat oximeter, and electrocardiography.

While in the sitting position giving hyperbaric bupivacaine 0.5% 2.5 mL (12.5 mg), and afterward the ladies were placed in the recumbent position with a 15°-30° remaining sidelong tilt soon after accepting the anesthesia. Control assemble had the conventional nursing care. For the leg pressure amass pressure knee leggings were connected, a thigh - length slope pressure stocking was utilized, pressure weight level was in the vicinity of 15 and 20 mmHg. The pressure knee socks were connected to the finish of CD.

Each group of leg compression and control the measures of hemodynamic were recorded by noninvasive blood pressure, pulse oximeter, and electrocardiography arterial systolic blood pressure (ASP), diastolic blood pressure (DAP), and mean arterial blood pressure (MAP) baseline and every minute after SA till the finish of CD. The definition of baseline hemodynamic variables measures is the average of three following consecutive recordings with less than 10% variation over 10 min before pre-hydration. In the present study, hypotension was defined as diminish in any MAP measurement by extra or more than twenty percentage (20%) of the baseline.

First and after fifth minutes Apgar scores were also noted. Immediately after delivery, the leg compression socks were removed and samples were collected from umbilical arterial and vein blood by the researcher by using heparinized syringes and deliver to the laboratory within one hour of collection and analyzed for blood gases and pH detection to diagnose neonatal acidosis (means a high hydrogen ion concentration in the tissues). Apgar scores were too noted at first and after fifth minutes. Duration of surgery and any intraoperative complications were recorded.

III. Results

Table (1) illustrates Parturient in both groups the study (intervention) and control (routine hospital care) groups were matched for socio-demographic characteristics. They had a close mean age 26.0 ± 3.26 and 25.6 ± 3.8 years for the study and control groups respectively. Meanwhile, Furthermore, this table reveals that, there were no statistically significant difference between both groups regarding the mean score of height, weight, and body mass index.

The current CD indications among women undergoing CD are demonstrated in table (2). It is obvious that previous CD was the most common indication with the highest percentage in the study and control groups (34.0% & 36.0% respectively). This is followed by mal-presentation and cephalopelvic disproportion.

Table (3) illustrates that there was not any significant difference between the groups in regard to estimated pregnancy age (weeks), the duration for surgery from block to delivery, delivery to end of surgery, total duration of surgery.

Table (4) presents the base line characteristics of hemodynamic variables including, SAP, DAP and MAP. It was observed there were a statistical significantly in two groups about different hemodynamic results with P value (>0.05).

Table (5) reveals hypotension incidence for the studied hemodynamic items variables, it was pointed out that hypotension of SAP, DAP, and MAP influenced a larger percent of females at the control group than these inside leg compression group. Also, it was noted that there was a highly significant difference statistically among both control group and leg compression.

Figure (1) hints at the conveyance of hypotension among the considered moms in the leg pressure and the control. It was seen that both sickness and vomiting as an indication of hypotension were incredibly found among moms at the control mothers group, they were spoken to as 83.6% & 80% respectively compared to 60.9% & 39.1% among moms in the leg pressure gathering while P-esteem < 001 .

Table (6) displays that, the neonatal attributes of the leg pressure and the control gathering. It was watched that, there was no factually critical distinction (statistically significant) with respect to neonatal birth weight and neonatal sex among the two gatherings. Then again, there was a profoundly factually huge distinction between two gatherings in connection to the Apgar score of the neonate at the main moment and the

neonatal acidosis (p < .001**). Moreover, there was a factually critical contrast in regards to the Apgar score of the neonate at the fifth moment, and affirmation of the neonate to intensive care unit of neonate.

Table (1):Distribution of General Characteristics of Studied Women.

general characteristics	group of leg compression n=(125)	Control group n=(125)	Chi square	P value
Age in years	26.0 ± 3.26	25.6 ± 3.8	5.293	0.071
Mean ±SD				
Body weight	76.58 ± 4.96	77.62 ± 5.35	1.490	0.138
Length(high)	164.3±3.48	164.2±3.68	1.437	0.918
Body mass index	27.88 ± 1.29	28.51 ± 3.91	1.605	0.110

t:t-test X²:Chi-Squaretest * Significant at P≤0.05.

Table (2): Current Cesarean Delivery Indications of the Studied Mothers.

Indications of the current cesarean section	Group				Significance(P)
	Study (n=125)		Control (n=125)		
	No	%	No	%	
Pelvic disproportion	31	24.8	30	24.0	χ ² 0.227(0.893)
Mal – presentation	36	28.8	34	27.2	
Mother choice	15	12.0	16	12.8	
Previous cesarean section	43	34.4	45	36.0	

^{MC}P: MonteCarlotest * Significant at P≤0.05

Table (3): Characteristics of the Existing Cesarean Section of Studied Women.

Variable	Group of Leg Compression n=(125)	Group of 1 group n=(125)	t test	P value
CesareanSection No.	1.7±.74	1.65±.71	0.213	0.832
Estimated gestational age (weeks).	38.48 ± 1.0	38.67 ± 1.11	1.312	0.191
Time between delivery to the end of cesarean delivery(min)	32.2±4.8	32.4±3.8	1.567	0.916
Total duration of cesarean delivery(min)	48.2±4.48	47.4±5.68	1.237	0.615

Table (4):Distribution of Base Line Hemodynamics of the Studied Mothers.

	Leg Compression Group (n=125)	Control Group (n=125)	Test of sig	p
S.A.P base line (mmHg)				
Min. – Max.	110.0 – 131.0	95.0 – 137.0	t=2.990*	0.003*
Mean ± SD.	120.85 ± 6.69	117.71 ± 8.74		
D.A.P. base line (mmHg)				
Min. – Max.	70.0 – 90.0	60.0 – 90.0	t=3.843*	<0.001*
Mean ± SD.	81.45 ± 6.25	77.45 ± 8.98		
M A.P base line (mmHg)				
Min. – Max.	83.0 – 102.0	70.0 – 102.0	t=4.177*	<0.001*
Mean ± SD.	94.22 ± 5.83	89.81 ± 9.41		

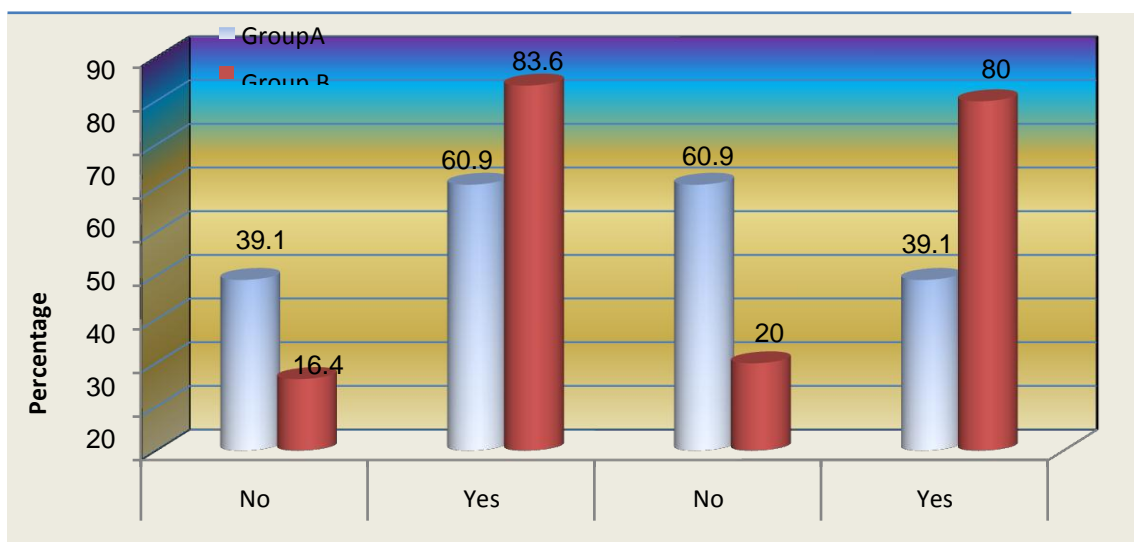
t, p: t and p values for Student t-test for comparing between the two groups *: Statistically significant at p ≤ 0.05

Note. (; MAP : mean arterial pressure SAD : systolic arterial pressure; DAP : diastolic arterial pressure.)

Table (5):Incidence of Hypotension among Studied Mothers.

Variable	Leg compression group n=(42)		Control group n=(72)		P value	P value
Hypotension of SAP	38.1	61.9	71.6	28.4	72.11	<0.001**
Hypotension of DAP	41.5	58.5	76.0	24.0	78.95	<0.001**
Hypotension of MAP	36.2	63.8	94.5	5.5	268.33	<0.001**

** Highly statistical significant difference at <0.001.



Group A=Leg compression, group B=control group

Figure (1): Presence of nausea and vomiting

Table (6): Neonatal Characteristics of Studied Women .

Variable	Group of Leg compression (125)		Group of Control (125)		Chi square test	P
	No	%	No	%		
Neonatal birth weight in (grams).					5.737	0.054
< 2500	12	9.6	10	8.1		
2500-	107	85.6	109	87.2		
3500-	6	4.8	6	4.7		
Mean ±SD	2595.4±356.9		2577.2±357.7			
Neonatal sex					0.904	0.342
Male	75	60	72	57.6		
Female	50	40	53	42.4		
Apgar score at 1 minute					22.07	0.001**
Good (7-10)	107	85.6	85	68.0		
Moderate asphyxia (5-7)	16	13.0	27	21.6		
Sever asphyxia (≤4)	2	1.4	13	10.4		
Apgar score at 5 minute					8.47	0.05*
Good (7-10)	117	93.6	88	70.4		
Moderate asphyxia (5-7)	5	4.0	31	24.8		
Sever asphyxia (≤4)	3	2.4	6	4.8		
Neonatal acidosis					11.40	0.001**
Yes	20	16.0	45	36.0		
No	105	84.0	80	64.0		
Admission to intensive care					5.800	0.05*
Yes	9	7.2	19	15.2		
No	116	92.8	106	84.8		

* Significant difference at <0.05. ** Highly significant difference at <0.001.

IV. Discussion

CD is a surgical procedure performed in all hospital; in this manner, an appropriate protocol for prophylaxis from hypotension PS for CD must be easily utilized and applied by nurses. Proper suitable protocol in addition, must avoid the use of sophisticated and device expensive to be appropriate for setting with limited supplies and resources. Our study finding gives an easy, non-pharmacological, fast, and efficient way to reduce of spinal related hypotension with no effect of the spinal block level.

The current research paper results revealed that there was a significant decrease in the incidence of hypotension (24 %) among LC group contrasted to the control group. This result is similar to results of **Mohamed, et al., (2016)**⁽¹¹⁾ who found an extremely statistically significant difference between the control groups and the leg compression group about hypotension of the mean arterial blood pressure, systolic arterial pressure, and the blood pressure of diastolic arterial.

In this respect, **Caille, et al., (2008)**⁽¹²⁾ reported that LC makes and induces auto- blood transfusion from the inferior extremities to the central circulation; consequently, LC rises the heart output as a result of increases cardiac preload. **Monnet & Teboul (2008)**⁽¹³⁾ study utilizing radiolabeled erythrocytes stated a decrease of one third percent in counts from the radiolabeled intravascular space due to the calves following LC it is matching to about one hundred fifty ml.

Our findings are in the same line with **Morgan et al., (2001)**⁽¹⁴⁾ they studied the impacts of central blood volume increase prior to spinal anesthesia during CD: a systematic review. They reported that LC diminished but did not eliminate the incidence of PSH during CD. Also, **Adsumelliet, al., (2003)**⁽¹⁵⁾ studied the effect of compression devices sequential (CDS) with thigh. high sleeves supports mean arterial pressure throughout caesarean delivery under spinal anesthesia, their data denoted that more than twenty percent decrease in MAP happened in fifty percent of mothers in the CDS group versus ninety percent in the control group difference significantly was noticed.

Moreover, a difference significantly was noticed among (wrapping & elevation of legs) was an elevated MSAP, reduce and lower the percentage of hypotension, and late onset time of hypotension in a study held by **Khedr, (2011)**⁽¹⁶⁾ in a study about evaluation of prophylactic and preventive ways to diminish hypotension post - spinal anesthesia for planned CD.

Comparison between each groups of the current study showed that there was highly significant difference in the mean arterial blood pressure. This is in agreement with the study conducted by **Mohamed et, al., (2016)**⁽¹¹⁾ & **Goodie et al. (1988)**⁽¹⁷⁾ where the fall in DAP and MAP was greater in the control group than in leg wrapped group. In their study, **Adsumelli et al. (2003)**⁽¹⁵⁾ founded that 50% higher incidence of significant MAP reduction in the control group compared with the sequential compression device group.

Consequently, persistent maternal hypotension is associated with maternal nausea and vomiting and detrimental unsafe to the fetus. Also, can worse lower the Apgar scores, prolong the time to sustained respiration and, fetal acidosis. The present study denoted that it observed to affect control group more than intervention group. These outcomes may be correlated to incidence of hypotension was highest amongst control group.^(3&4)

Concerning neonatal results, it was founded that there was no statistical difference significant between two groups as regards sex, weight of neonates these are in the same line with **Monnet & Teboul 2008** in their study about passive leg raising⁽¹³⁾, they reported there wasn't statistically significant difference in between studied women regarding neonatal weight and sex.

Regarding condition of neonates, assessed by umbilical cord blood gases and scores of Apgar at one & five minutes. The existing study reported that they were brilliant in control group with highly difference statistically significant, and a significant difference observed between both categories groups. As maternal blood pressure affect utero-placental circulation and hence fetal wellbeing. These findings were corresponding to data reported by **Mohamed, et, al., 2016**⁽¹¹⁾ in their study of lower leg compression utilization technique for decreasing related risks for mothers and neonates of spinal induced hypotension during cesarean delivery. They founded that a highly statistically difference significant among two groups concerning neonates Apgar score at the assessments of first and fifth minutes and the acidosis of neonates ($p < .001^{**}$). Moreover, admission to intensive neonatal care unit of those neonates.

Neonatal acid-base balance had affected by PSH. Thus, threatening fetal life. Neonates delivered to mother's suffers from hypotension are significantly more acidotic than those who didn't. These conclusions are agreed as well as with **Mohamed, et al., (2016)**⁽¹⁵⁾ who reported that there is a significant relation between neonatal acidosis and maternal hypotension. Moreover, the study result was in the same line with **Ueyama (2009)**⁽¹⁸⁾ reported in the paper to assess the effects of colloid preload and crystalloid on blood volume on the parturient undergoing spinal anesthesia for cesarean delivery the maternal be affected by hypotension had a clear strong correlation with acidemia of neonatal.

V. Conclusion

LC for women undergoing CD directly after spinal block decreased or decline the occurrence of post spinal hypotension (PSH) and neonatal acidosis.

VI. Recommendations

Since legs compression with socks is easy, noninvasive, available, and no pharmacological method, leg compression during cesarean can be recommended for preventing post spinal hypotension

References

- [1]. **Mercier FJ, Augè M, Hoffmann C, Fischer C, Le Gouez A. (2013):** Maternal hypotension during spinal anesthesia for caesarean delivery. *Minerva Anesthesiol.* 79 Suppl 1:62–73.
- [2]. **Butwick a. J, Columb MO, CarvalhoB.(2015):** Preventing spinal hypotension during Caesarean delivery: What is the latest? *Br J Anaesth.* 114(2): 183-6.
- [3]. **Mavridou I, Stewart A., & Fernando R., (2013):** Maternal Hypotension during Spinal Anesthesia for Cesarean Delivery, *Curr. Anesthesiol Rep.*, (3): 282–291.
- [4]. **LoubertC.(2012):** Fluid and vasopressor management for Cesarean delivery under spinal anesthesia: continuing professional development. *Can J Anaesth.* 59(Suppl 6):604–19.
- [5]. **FarrukM.,Aneela.P.&Vigar.A.(2008):**Prevention of hypotension in cesarean delivery under spinal anesthesia; the combination of modified supine wedged position, crystalloid co-hydration and prophylactic atropine. *Pakistan .Armed. Forces Medical Journal*,58(4):2411.
- [6]. **Cluver C., Novikova N., Hofmeyr G, &Hall D. (2010):** Maternal position during caesarean section for preventing maternal and neonatal complications. *Cochrane Database Syst. Rev.* (6):CD007623.
- [7]. **Fletcher J, MoffattC,Partsch H, Vowden K, &Vowden P. (2013):** Principles ofcompressioninvenousdisease:A practitioner’s guidetotreatmentandpreventionofvenouslegulcers, *WoundInternational,EnterpriseHouse,p.1-.21.*
- [8]. **Loubert C. (2012):**Fluid and vasopressor management for Cesarean delivery under spinal anesthesia: Continuing professional development. *Can J Anaesth.*; 59: 604-19.Doi.org/10.1007/s12630-012-9705-9.
- [9]. **Habib AS. (2012):** A review of the impact of phenylephrine administration on maternal hemodynamics and maternal and neonatal outcomes in women undergoing cesarean delivery under spinal anesthesia. *AnesthAnalg.* 114: 377-90. PMID:22104076http://dx.doi.org/10.1213/ANE.0b013e3182373a3e.
- [10]. **chlesselmanJ.(1982):**Casecontrolstudies:design,conduct,analysis.OxfordUni.Press,NewYork,pp145-146
- [11]. **Mohamed A, ElazharyA,Abdelhady R,&SadekB. (2016) :** Utilization of lower leg compression technique for reducing spinal induced hypotension, and related risks for mothers and neonates during cesarean delivery. *Journal of Nursing Education and Practice* 6, (7):11-18
- [12]. **Caille V, Jabot J, BelliardG.,CharronC,Jardin F, &Viellard-Baron A.(2008):**.Hemodynamic effects of passive leg raising: an echocardiographic study in patients with shock. *Intensive Care Med.* 34(Suppl 7):1239–45.
- [13]. **MonnetX,&TeboulJL.(2008):**Passivelegraising.*IntensiveCareMed.*34(Suppl4):659–63.
- [14]. **Morgan P, Halpern S, &Tarshis J.(2001):** The effects of an increase of central blood volume before spinal anesthesia for caesarean delivery: a qualitative systematic review. *AnesthAnalg.*92 (Suppl 4):997–1005.
- [15]. **Adsumelli R., Steinberg E., Schabel J., Saunders T., & Poppers P.,(2003):** Sequential compression device with thigh-high sleeves sup-ports mean arterial pressure during caesarean section under spinal anesthesia. *Br J Anaesth;* 91: 695-8.
- [16]. **Khedr N. (2011):** Preventive Measures to Reduce Post - spinal Anesthesia Hypotension for Elective Cesarean Delivery. *Journal of American Science*,7(2). 744-750.
- [17]. **Goudie T., Winter A., Ferguson D.(1988):** Lower limb compression using inflatable splints to prevent hypotension during spinal anesthesia for caesarean section. *ActaAnesthesiol Scand.*; 32:541-4.
- [18]. **Ueyama H, He YL, Tanigami H, MashimoT,&Yoshiya I,(2009):** Effects of crystalloid and colloid preload on blood volume in theparturientundergoingspinalanesthesiaforelectivecesareansection.*Anesthesiology*;91:1571-6.

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