ISSN: 2474 - 9206

Research Article

Journal of Anesthesia & Pain Medicine

Assessment of the Magnitude and Risk Factors of Post Spinal Relevant Hemodynamics Associated with Caesarean Section in Bahirdar University Hospital, Northwest Ethiopia, 2020

Yilkal Tadesse*, Kassaw Moges, Fantahun Tarekegn

Department of Anesthesia Bahir Dar University, Bahir Dar, Ethiopia

***Corresponding author**
Yilkal Tadesse, Department of Anesthesia, Bahir Dar University, Ethiopia

Submitted: 24 Jan 2022; **Accepted:** 29 Jan 2022; **Published:** 22 Feb 2022

Citation: *Yilkal Tadesse, Kassaw Moges, Fantahun Tarekegn (2022) Assessment of the Magnitude and Risk Factors of Post Spinal Relevant Hemodynamics Associated with Caesarean Section in Bahirdar University Hospital, Northwest Ethiopia, 2020. J Anesth Pain Med 7(1): 44-52.*

Abstract

Background: *Maternal hemodynamics is a common clinical problem for caesarean section under spinal anesthesia. The main objective of this study was to determine magnitude of post spinal hemodynamics and factors associated with relevant maternal hypotension during caesarean section.*

Materials and Methods: *This cross-sectional clinical study was conducted among 143 pregnant mothers who underwent caesarean section from January 29 to April 15, 2020. Simple random sampling technique was conducted with fulfilling the inclusion criteria. Maternal hemodynamic changes and the severity were assessed within 60 minutes after spinal injection. The systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR) of parturient were recorded during the perioperative period. These times of recording were including the admission to operating room (preanaesthetic baseline), immediately after anesthesia (displayed as 0 time), and minutes of 3, 5, 15, 20, 25, 30, 35, and 60 after spinal injection.*

Results: *The incidence of relevant maternal hypotension was 55.9 %. From these, 31patients (21.7%) were connected with sever hypotension. There was a highly significant relationship to sensory block height above T4, at 10 minutes of post spinal anesthesia P < 0.001 (AOR= 5.340; 95% CI: 2.235 - 12.762), Elective degree of urgency involved P_ 0.038 (AOR=0.207; 95% CI: 0.047 - 0.918) and Dose of local anesthetic more than 2.5 ml or > 12.5 mg of bupivacaine, P_0.001 (AOR= 7.815; 95% CI: 2.338 – 26.12).*

Conclusion and Recommendation: *Lowering the intrathecal dose of spinal anesthesia seems to be a useful technique to reduce the incidence of hypotension and better preserves maternal hemodynamic stability. The study showed that the incidence of relevant hypotension will increase when the analgesic block level become higher than T4 dermatome within 10 minutes. Depending on the degree of urgency, a parturient with an emergency base for caesarean delivery may be a useful tool to predict relevant hypotension during spinal anesthesia. The hospital management and responsible clinicians of GUH need to minimize the incidence of post spinal relevant hypotension by adquate preotimization and taking to account avaliable options.*

Keywords: Adverse Events, Caesarean Section, Hypotension, and Spinal Anesthesia

Acronyms

AOR Adjusted odds ratio
ASA American Society of Anesthesiologists
ANS autonomic nervous system
BMI body mass index
C/S caesarean section
COR crude odds ratio
CSE combined spinal /epidural
CSF cerebrospinal fluid
DBP diastolic pressure
ECG electrocardiography
GUH Gondar university hospital
HR heart rate
Hx history
MAP mean arterial pressure
MET metabolic equivalents
MMR maternal mortality rate
PP pulse pressure
SHACS spinal haemodynamics associated with caesarean section
Rx treatment
SBP blood pressure
SHSP supine hypotensive syndrome of pregnancy
SpA spinal anaesthesia
SpO2 hemoglobin oxygen saturation
WHO World Health Organization

Background

Pregnancy brings about profound alterations in maternal hemodynamics. Among obstetric emergencies, caesarean section is the most common operative procedure carried out in the world [2]. The most common cause of hypotension after spinal anesthesia is cesarean delivery [4]. In other studies, the incidence of hypotension after subarachnoid administration of 0.5% bupivacaine varied from 50% to 80% in caesarean section deliveries [2, 6, 7]. Sanborn's study demonstrated that hypotensive episodes detected by an automated record-keeping system were clearly related to maternal death and poor infant outcome [11. Regional anesthesia is undoubtedly the most popular technique for cesarean section. In particular, spinal anesthesia is commonly used for cesarean delivery, which provides a fast, profound, and symmetrical sensory and motor block of high quality in patients undergoing cesarean delivery [7, 8]

Despite the fact that hypotension is defined as a subnormal arterial blood pressure, numerous research adopted hypotension criteria that included a 25% decrease in mean arterial blood pressure as the definition of relevant hypotension [17, 5, 26]. The authors also defined common acceptable heart rate of less than 60 as bradycardia Hypotension induced by central neuraxial block is mostly due to a reduction in systemic vascular resistance [3]. This is caused by the preganglionic sympathetic fiber blockage after intrathecal administration of local anesthetic [22].

Systemic hemodynamic regulation is modulated by the autonomic nervous system (ANS). Differences in the regulation of the ANS among patients' character may explain a hemodynamic difference in response to SpA. Pregnant patients develop more extensive spinal blocks than non-pregnant patients [1]. This is due to increased sensitivity to local anesthetics as well as the mechanical consequences of epidural vein engorgement, which is exacerbated by aortocaval compression during pregnancy [25]. As a result, cardiac output normally declines rather than increasing as a compensatory mechanism. Therefore, significant hypotension after spinal anesthesia is due to the combination effect of decreased cardiac output and lower systemic vascular resistance. The decrease in blood pressure ultimately reduces cerebral blood flow to the extent that cerebral hypoxia occurs and causes maternal nausea and vomiting. The main objective of this study was to determine magnitude of post spinal hemodynamics and factors associated with relevant maternal hypotension during caesarean section.

Objectives

General Objective

To assess the magnitude and associated risk factors of post spinal relevant hemodynamics in both elective and emergency parturient who came for caesarian delivery in GUH

Specific Objectives

- To determine the incidence of relevant maternal hypotension during spinal anaesthesia for caesarean section
- To identify risk factors associated with episodes of post spinal relevant hypotension
- To describe the incidence of bradycardia, the severity of relevant hypotension and its potential correlation with other adverse events

Methodology

Study Setting, Design and Period

An institutional based quantitative cross sectional study was conducted in Gondar University Hospital obstetrics ward and Operation Theater from January 29 to April 15, 2014

Target Population

The target subjects of this research were all obstetric mothers who delivered by caesarean section under spinal anaesthesia

Study Population

The study populations were obstetric mothers who undergone caesarean section procedures under spinal anaesthesia in Gondar University Hospital

Sampling Method

The convenient sampling method was conducted for all patients fulfilling the inclusion criteria at the time of data collection.

Inclusion and Exclusion Criteria

Inclusion Criteria

The inclusion criteria were all patients undergoing caesarean section procedure with spinal anesthesia in the data collection period.

Exclusion Criteria

The exclusion criteria were parturient with non cooperative, concurrent obstetric haemorrhage, sever pre-eclamsia and combined spinal-epidura (CSE) technique with a necessity of epidural top up.

Data collection procedures

Intermittent noninvasive blood pressure monitoring, continuous measurement of heart rate (HR), hemoglobin oxygen saturation (SpO2), and electrocardiography (ECG) were the most used hemodynamic monitors in ordinary clinical practice from the operation room to the recovery room. Blood pressure was checked at least every 5 minutes in our setup. The oxygen saturation and heart rate were constantly monitored from the time the spinal anesthetic was administered until the patient was moved to the recovery room. After obtaining approval from the ethics committee of university of Gondar, the questionnaire was pretested and data collection was carried out. Maternal hemodynamic changes during 60 minutes after spinal injection were assessed among the parturient fulfilling the inclusion criteria. Systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR) and mean arterial pressure (MAP) were recorded starting from admission in to operating theater (baseline), then immediately after anesthesia (displayed as time 0), and minutes 3, 5, 15, 20, 25, 30, 35, and 60 after spinal injection.

Side effects of spinal anesthesia included were relevant hypotension episodes, spinal injection to relevant hypotension interval, prolongation of hypotension, extent of changes in blood pressure (severity), bradycardia, nausea, vomiting, shivering and fainting. Patient-related variables, surgical variables, anaesthetic variables and regional anaesthesia related variables were also collected for the analysis of association with the dependent or outcome variable.

Data Quality Management

To ensure quality of data pretest of the questionnaire was done on 15 patients to check for completeness, accuracy and clarity of obtaining data from the data collection tool. To do this one qualified anesthetist was assigned after training was given. The data collection procedure was monitored and supervised by the responsible investigator all through the period.

Variables of the study

Dependent Variable

Relevant maternal hypotension

Independent Variables

Demographic variables, surgical variables, anesthetic variables, and regional anesthesia related variables

Operational Definitions

- Hypotension was defined as a decrease in mean arterial blood pressure (MAP) of 20% from preanaesthetic baseline values
- Relevance was defined as a decrease of 25% and severs for more than 30% decrease in MAP and also an episode prolonged for more than 10 min while a therapeutic intervention with fluids or vasopressors was being used.
- Survival time is defined as the time to event interval from spinal injection to the first episode of hypotension.
- Prolongation of hypotension is the time interval that MAP is sustained 25% below the preanaesthetic baseline measures.
- Metabolic equivalent (MET) values: **1 MET** (eating and dressing), **3 MET** (light housework, walking), **4 MET** (walking on level ground at >6 km/hr), **6 MET** (short run), and >**10 MET**- strenuous sport.
- Expected blood loss implies the anticipated amount of blood loss based on the surgical condition as reported by the surgeon who has been blind to the study.
- Degree of urgency for caesarean section: **Immediate** (there is an immediate threat to the life of the mother or fetus), **Urgent** (maternal or fetal compromise that is not immediately life threatening), **Early** (no maternal or fetal compromise, but needs early delivery), **Elective** (delivery timed to suit mother and staff).
- Left uterine displacement is some degree of left lateral tilt (15-30 degrees) using a wedge or table tilt.
- Each spinal segment supplies a specific region of skin and a number of muscles: Perineum (S1-S4), Inguinal region (L1), Umbilicus (T10), Subcostal arch (T6-T8), Nipple line (T3-T5), Second intercostal space (T2), Clavicle (C3-C4) as determined by pinprick.

Data Analysis Procedure

The primary outcome of this study was defined as the incidence of relevant hypotension. Secondary outcomes include extent of changes in blood pressure, survival time (spinal injection to hypotension interval), prolongation of hypotension, incidences of bradycardia, nausea, vomiting, shivering, and fainting. The data was coded into numerical values after it was checked for completeness and mistakes. The statistical analysis was carried out with the help of the statistics program SPSS version 21. The study population was described using frequencies, proportions, and association summary statistics in connection to the appropriate primary outcome variable. To identify relevant factors and establish the strength of the link, researchers used odds ratios, 95 percent confidence intervals, p-value, with bi-variant and multi-variant logistic regression.

As a target criterion, the dichotomous variable "relevant hypotension after spinal anesthesia (yes/no)" was used. The chi square (x^2) statistics test was used to determine whether categorical variables had a significant relationship or not. The t-test was used to evaluate continuous variables. Logistic regression was used to evaluate the association between independent and dependent variables within a multivariate model. The significance of the study was considered when the p value <0.05.

Ethical Consideration

At the start of February, the study proposal was sent to the institutional ethic committee of the faculty of medicine and health sciences in research review board of Bahirdar University, Ethiopia then approval was taken. Written informed consent was taken from each patient and privacy of patient's was assured all the time during data collection procedures.

Informed Consent Form:

Hello! My name is ……. I am one of the members in this research team. I am here to collect some important information regarding haemodynamic changes after spinal anaesthesia. It will not harm you or your name will not be listed out. If you are not willing, you can say I am not willing to participate in this research. However, your willingness will have great importance for identifying relevant causes and preventing complications. So, I would like to ask you, if you are willing to participate in this research.

I understood about the objectives of the research and the roles I will have in the research. I have agreed to participate in the research.

A. Agree B. Disagree

If Respondent agrees to be interviewed, the interview will be started.

Result

The study was completed by all patients' participation. During the study period, 143 parturients were enrolled in undergoing cesarean section under spinal anesthesia. A successful spinal block was performed on all of the parturients that were observed. The entire data were carefully recorded. An episode of relevant hypotension: a decrease in MAP within 60 minutes after induction with spinal anesthesia was recorded. On average, 55.9% of pregnant women had a relevant hypotension, and severe hypotension was detected in 31 of those patients (21.7%).

The following factors didn't show significant association with relevant hypotension: age, BMI, preoperative history of hypotension, history of endocrine illness, type of premedication amount of prehydration fluid, type of utero-tonic agent given, position for spinal anaestheia, spinal needle size, type of local anaesthtic, time of higher block post spinal puncture, and total fluid volume given (Table 1).

Table 1: Demographic and metric predictors for relevant hypotension with mean values, SD, median with the 25th and 75th Percentiles of the distribution.

	Relevant hypotension			No relevant hypotension		
Variable	**n**	**Mean ± SD**	**Median, 25th & 75th % of distribution**	**n**	**Mean ± SD**	**Median, 25th & 75th % of distribution**
Age (yr)	143	26 ±11	27 (19/39)	143	27 ± 7	27 (18/38)
Height (cm)	143	164 ± 5	161(153/166)	143	161 ± 5	160(155/168)
Weight (kg)	143	58.2 ± 9	59 (48/69)	143	59.8 ± 9	55 (48/69)
BMI (kg/m²)	143	22.9± 4	23(20.4/26.4)	143	22.9± 4	21.4 (19/24.2)
Bupivacaine 0.5 % (ml)	76	2.5 ± 0.4	2.6 (2.4/2.7)	56	2.6 ± 0.8	2.8 (2.7/2.9)
Lidocaine 2% (ml)	4	2.7 ± 0.6	2.9 (2.8/3)	7	3 ± 0.3	3 (3/3)
Crystalloids (ml)	143	462 ± 224	500 (500/500)	143	463 ± 214	500 (500/500)

Preanesthetic evaluation of patients revealed history of hypertension in 11 patients (7.7%), endocrine illness in 2 patients (1.4%), and long-term antihypertensive medication in 8 patients (5.6%). IV sedation medication was given for 23 patients (16.1%). Eight patients (5.6%) were taken vasopressor (epinephrine) and average dose of IV epinephrine administered for the treatment hypotension was 12.96 (8.279). For almost all patients (99.3%) SpA was performed on sitting position and only for one patient (0.7%) it was done laterally. Peak anaesthetic level reached above T4 dermatome segment in 96 patients (67.1%), at 15 minutes after conduction of spinal anesthesia. (Table2)

Table 2: The clinical characteristic of parturients undergoing caesarean section with, univariate analysis (x^2 statistics test/ fishers' exact test).

	Relevant hypotension			
Variables	**N**	**Yes (n=80)**	**No (n =63)**	**P value**
Age (yr)	143			0.286
≤ 29		55 (59.8%)	37 (40.2%)	
≥ 30		24 (49%)	26 (51%)	
BMI (kg/m²)	143			0.541
< 18.5(Underweight)		4 (80%)	1 (20%)	
18.5- 24.9(Normal)		57 (54.7%)	47 (45.2%)	
25-25.9(Over weight)		19 (55.9%)	15 (44.1%)	
History	143			
Hypertension		10 (90.9%)	1 (9.1%)	0.034
Hypotension		2 (66.7%)	1 (33.7%)	1.00
Endocrine diseases		1 (50%)	1 (50.0%)	1.00
Long-term anti-hypertensive Rx		8 (100%)	0 (0.0%)	0.009
Degree of urgency for C/S	143			0.045
Immediate		21 (77.8)	6 (22.2%)	
Urgent		30 (56.6%)	23 (43.4%)	
Early		23 (47.9%)	25 (52.1%)	
Elective		6 (40.0%)	9 (60.0%)	
ASA physical status	143			0.035
ASA I		59 (50.9%)	57 (49.1%)	0.050
ASA II		15 (75.0%)	5 (25.0%)	0.052
ASA III		6 (85.7%)	1 (14.3%)	0.109
MET Equivalent values	143			0.009
3 MET		6 (50 %)	6 (50 %)	0.584
4 MET		17 (37.8 %)	28 (62.2%)	0.054

6 MET		34 (72.3%)	13 (27.7)	0.194
> 10 MET		23 (59.0%)	16 (41.0%)	0.012
Estimated blood loss	143			0.002
≤ 500 ml		47 (46.5%)	54 (53.5%)	0.001
500-1000 ml		26 (81.2%)	6 (18.8%)	0.170
> 1000 ml		7 (70.0%)	3 (30.0%)	0.003
Amount of prehydration fluid	143			0.531
< 500 ml		66 (54.1%)	56 (45.9%)	
500-1000 ml		11 (68.8%)	5 (31.2%)	
1000-1500 ml		3 (60.0%)	2 (40.0%)	
Left uterine tilt	143	2 (33.3%)	4 (66.7%)	0.405
IV sedation medication	143	8 (29.6%)	19 (70.4%)	0.04
Utero-tonic type given	143			0.227
Oxytocin		16 (69.6%)	7 (30.4%)	
Ergometrin		64 (53.3%)	56 (46.7%)	
Total fluid administered	143			0.408
1000-1500ml		5 (71.4%)	2 (28.6%)	
1500-2500ml		25 (48.1%)	27 (51.9%)	
2500-3000ml		38 (57.6%)	28 (42.4%)	
> 3000ml		12 (66.7%)	6 (33.3%)	

Table 3: Univariate analysis of the association of regional anaesthesia-related variables and adverse effects with relevant hypotension.

	Relevant hypotension			
Variables	**N**	**Yes (n=80)**	**No (n =63)**	**P value**
Position for SpA	143			1.000
Sitting		79 (55.6%)	63 (44.4%)	
Lateral		1 (100%)	0 (0.0%)	
Spinal needle size	143			0.960
≤ 21g		29 (54.7%)	24 (45.3%)	
22- 23 g		31 (57.4%)	23 (42.6%)	
≥ 24 g		20 (55.6%)	16 (44.4%)	
Local anaesthetic type	143			0.299
Bupivacaine 0.5%		76 (93.8%)	55 (87.3%)	
Carbonated lidocaine 2%		4 (6.2%)	8 (12.7%)	
Volume of local anaesthetic	143			0.002
2 -2.5 ml (2- 2.5 mg Bup)		57 (49.6%)	58 (50.4%)	
> 2.5 ml (> 2.5 mg Bup)		23 (82.1%)	5 (17.9%)	
Frequency of spinal puncture	143			0.010
1		23 (50.0%)	23 (50.0%)	
2		31 (47.0%)	35 (53.0%)	
3		14 (77.8%)	4 (22.2%)	
4		9 (90.0%)	1 (10.0%)	
≥ 5		3 (100%)	0 (0.0%)	
Sensory block level ≥ T4 at 10' post SpA	143			0.002
Yes		63 (65.6%)	33 (34.4%)	
No		17 (36.2%)	63 (44.1%)	

Adverse events				
Bradycardia	143	2 (2.5%)	1 (1.6%)	1.000
Nausea	143	56 (70.0%)	2 (3.2%)	<0.001
Vomiting	143	13 (16.2%)	1 (1.6%)	0.008
Shivering	143	9 (11.2%)	32(50.8%)	<0.001
Fainting	143	2 (2.5%)	1 (1.6%)	1.000

The following variables were identified with univariate analysis as having an association with a higher incidence of relevant hypotension: ASA physical status, preoperative history of hypertension, MET equivalent values, long-term antihypertensive therapy, estimated blood loss, frequency of spinal puncture and sedation after application of SpA.

The following factors didn't show significant association with relevant hypotension: age, BMI, preoperative history of hypotension, history of endocrine illness, type of premedication amount of prehydration fluid, type of utero-tonic agent given, position for spinal anaestheia, spinal needle size, type of local anaesthtic, time of higher block post spinal puncture, and total fluid volume given (Table 3).

In contrast, there was a highly significant relationship for sensory block height become above T4 at 10 min. post SpA (P _ 0.002), elective degree of urgency involved (P _ 0.007), and dose of local anaesthetic more than 2.5 ml or > 12.5 mg of bupivacaine, (P _< 0.001) (Table 4).

Table 4: The clinical characteristic of parturients undergoing caesarean section with multivariate logistic regression analysis

Variable	Coefficient	SE	P value	OR	95 % CI of odds ratio
Analgesia block height (≥ T4) at 10 min. post SpA	1.675	0.444	< 0.001	5.340	2.235 - 12.762
Degree of urgency for C/S (Elective)	- 1.573	0.759	0.038	0.207	0.047 - 0.918
Dose of local anaesthetic > 2.5 ml (12.5 mg of Bupivacaine)	2.056	0.616	0.001	7.815	2.338 - 26.120

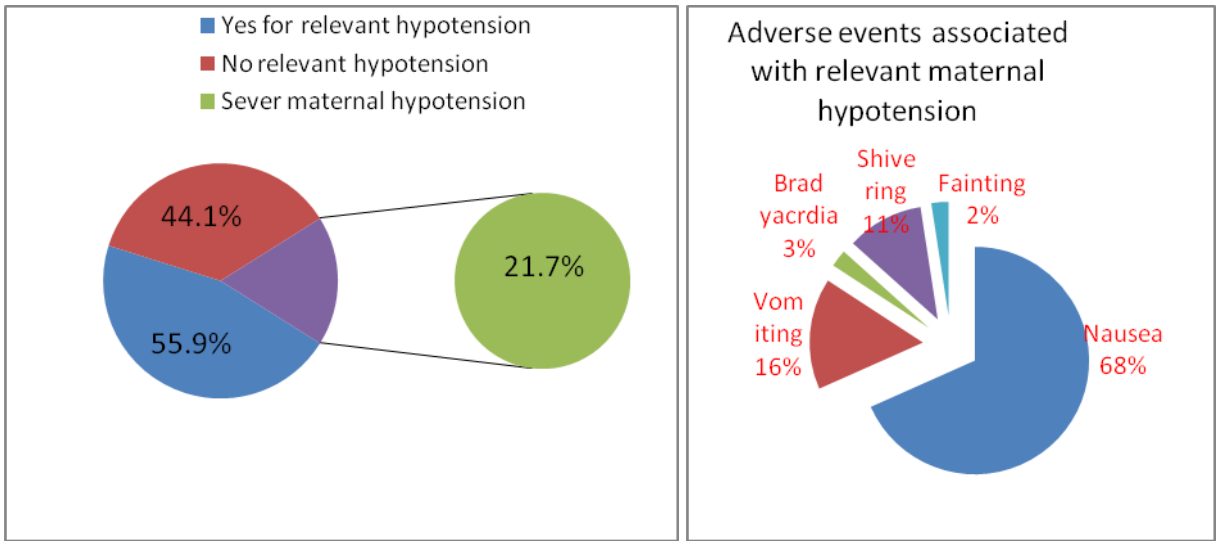

Figure 1: Magnitude of relevant maternal hypotension and its severity, and incidences of adverse events in correlation with episodes of relevant hypotension

Hypotension, bradycardia, and hypotension together with bradycardia occurred in 80 patients (55.9%), 3 patients (2.1%) and 2 patients (1.6%) respectively. Out of those 80 patients (55.9%), who had already shown relevant hypotension: nausea was noticed in 56 patients (70.0%), vomiting in 13 patients (16.2%), shivering in 9 patients (11.2%), and fainting in 2 patients (2.1%), (figure 1).

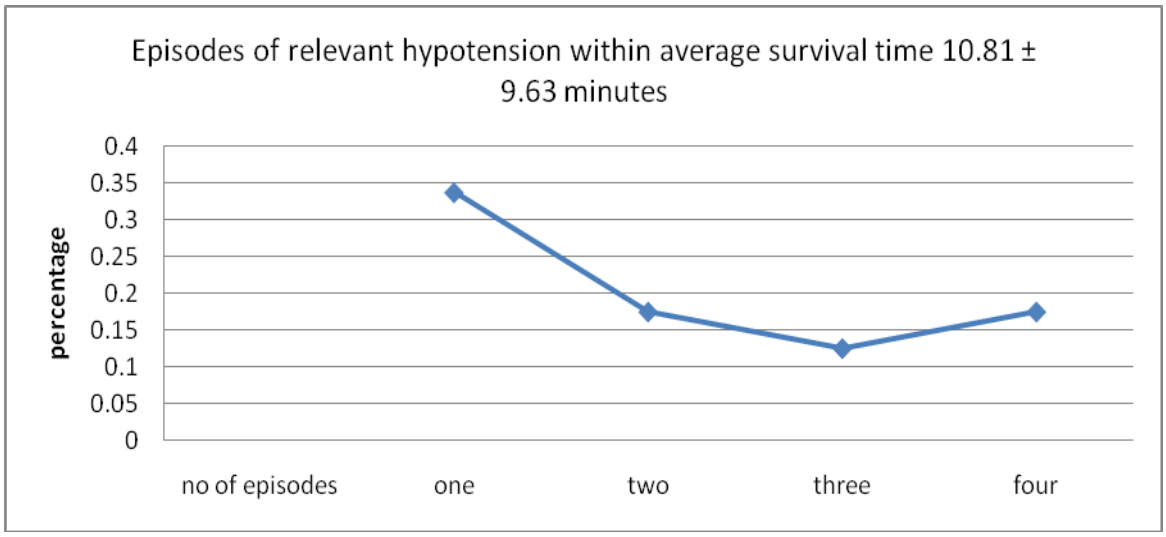

Figure 2: Distribution plot for relevant hypotension episodes in regard with survival time (time to event interval)

One, two, three and four episodes of relevant hypotension was experienced in 27 patients (33.8%), 14 patients (17.5 %), 10 patients (12.5 %), and 14 patients (17.5%) respectively. Average (standard deviation) time to event interval for relevant hypotension was 10.81 min (±9.63) with in (minimum 3 min and maximum at 60 min) ranges. (Figure 2)

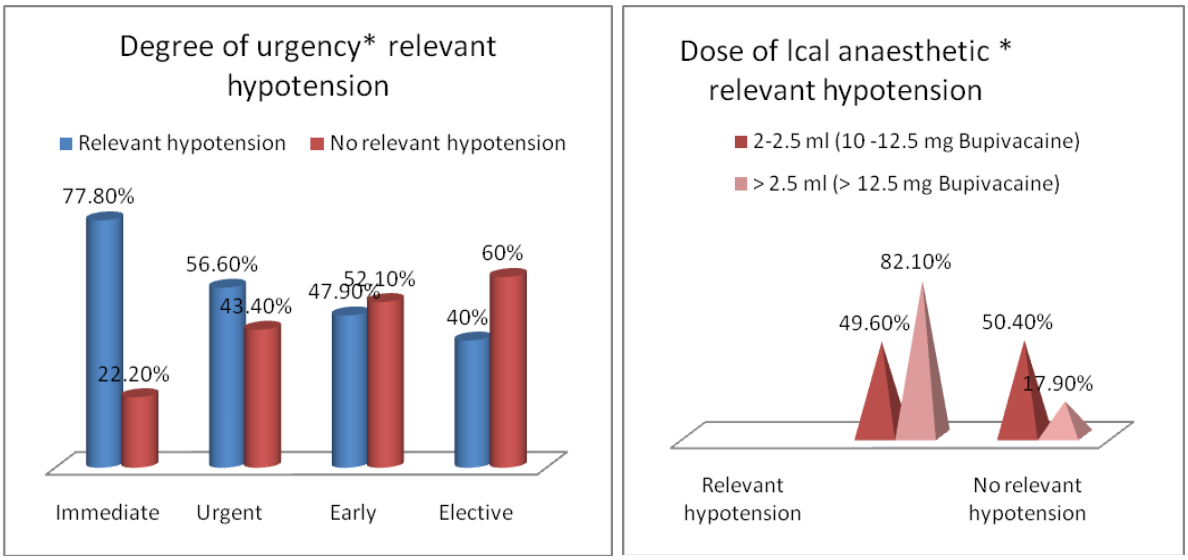

Figure 3: Association of degree of urgency and local anaesthtic doses with episodes of relevant

Discussion

Hypotension during spinal anaesthesia for caesarean section remains a common scenario in our clinical practice. In previous studies various criteria were used to define hypotension considering different cut-off points in mean arterial pressure or even a combination of two or more criteria. Contrary to these studies, our definition of relevant hypotensive episodes is based on MAP instead of systolic blood pressure readings, because MAP is the most important blood pressure variable concerning organ perfusion [1]. Levin A and Datta S found episodes of hypotension with an incidence of 65.1% in their study [4]. The relatively small incidence (55.9 %) of relevant hypotension observed in our study can be explained by our strict definition (more than 25% decreases in MAP).

In this study, we found a decrease of MAP in block level higher than T4 dermatome, was reconfirmed as a risk factor of hypotension. Analgesia block level became ≥ T4 at 10 min. post SpA showed strong association (OR 5.340) with incidences of relevant hypotension. This means that within 10 minutes after conduction of spinal anaesthesia, a parturient having level of block above T4 dermatome is 5.34 times more likely to develop relevant hypotension than below T4 dermatome level.

In contrast to other studies, we didn't find strong association of age, preoperative hypotension and BMI with hemodynamic difference in response to SpA. The dissimilarity may be explained by differences in the regulation of the ANS among parturients' character or genetic predisposition.

Considering the results of the present study, parturients who admitted in emergency base have shown higher proportion of hypotension episodes than parturients underwent elective surgery (AOR 0.207). This implies that about 80% of parturients with in elective surgery are less likely to develop relevant hypotension than emergency procedures (immediate/urgent). As far as our re-

view, most of the previous studies didn't show the significance of this result.

Although various factors may affect the appropriate sensory nerve blockage, for surgical anaesthesia, the local anaesthetic dose is the main determinant of its success. This study showed that a local anaesthetic dose of > 2.5 ml or more than 12.5 mg of 0.5 % bupivacaine has strong predictive association with relevant hypotension (AOR = 7.815). This implies that a parturient with local anaesthetic dose of more than 2.5 ml is 7.815 times more likely to develop relevant hypotension episode than with a dose of less than 2.5 ml. Most of the cases in this study were done with bupivacaine 0.5 % (92.3%).

In contrast to a study done by TarkkilaP, in this study there was no strong association observed with the use of IV sedative medication for inadequate or partial spinal anaesthesia [3]. This may be explained by the reason that frequently used sedative agent was ketamine (90.2 cumulative percentages) and which do have effects of increase in cardiac output unlike other sedative agents.

Our study has also demonstrated the beneficial effects of a vasopressor use (epinephrine) to prevent severity of hypotension as mentioned before, P_ 0.044 (OR=1.298; 95% CI: 1.184, 1.423). The result showed that an episode of relevant hypotension with no vasppressor intervention was 1.298 times more likely to develop sever hypotension and prolongation.

The present study showed that nausea, vomiting, and shivering occurred commonly during spinal anesthesia (40.6%, 10.5% and 30.8% respectively). These results are consistent with previous reports [3,6, 19]. Decrease in blood pressure ultimately reduces cerebral blood flow to the extent that cerebral hypoxia occurs and causes nausea [17]. There was significant correlation between the incidence of relevant hypotension and the incidence of nausea (70.0%), (p_< 0.001), vomiting (16.2%), (p_ 0.008), and shivering (2.5%), (p_< 0.001) in univariate analysis but not in multivariate. The incidence of bradycardia (2.1%) and bradycardia together with hypotension (1.6%) were low thus, prevented us from detecting the influence of other factors on the probability of bradycardia. However, in two patients (2.5%) there were sudden episodes of fainting concurrently seen with the episodes of relevant hypotension, suggesting markedly higher block and also a decrease in cardiac output by more than 50% [17].

Conclusion

This study reconfirmed the higher incidence of post spinal relevant maternal hypotension in caesarean delivery. Management of hypotension during regional anaesthesia in obstetrics continues to be controversial. Depending on the degree of urgency, a parturient with an emergency base for caesarean delivery may be a useful tool to predict relevant hypotension during spinal anesthesia. The focus should emphasize on preoptimizing any of existing unstable biochemical status and clinical condition. Crystalloid prehydration should no longer be considered mandatory. Lowering the intrathecal dose of spinal anesthesia seems to be a useful technique to reduce the incidence of hypotension and better preserves maternal hemodynamic stability. The present study also showed that the incidence of relevant hypotension will increase when the analgesic block level become higher than T4 dermatome within 10 minutes. Additionally; there is evidence to suggest that the use of vasopressor better improves the physiologic support and decrease the hypotension prolongation time.

Recommendations

The use of a lower dose local anaesthetics aims to decrease maternal side-effects (hypotension, intraoperative nausea/ vomiting), reduce the time to discharge from the postanaesthesia care unit, and improve maternal satisfaction. We suggest that a combined approach using preoptimization, vasopressor and a low dose CSE (combined spinal-epidural) anaesthesia technique is probably the best option to provide surgical anaesthesia and good postoperative analgesia for caesarean section. Preoptimization should include acute hydration for the existing deficit in volume status.

Finally, it may be said that parturients developing relevant hypotension during spinal anesthesia will probably also tend to develop hypotension during general anesthesia. The anaesthetist should not necessarily refrain from using spinal anesthesia in parturients with independent risk factors for relevant hypotension. However, the knowledge of these risk factors should be considered for increasing vigilance in those parturients who are most at risk for relevant hypotension. The knowledge is useful in allowing for timely therapeutic intervention, or even in suggesting the use of available alternative methods of spinal anesthesia, such as titrated continuous or small dose spinal anesthesia or reduction dose of spinal local anesthetic agent and to supplement other available opioids. We recommend that future researches to be directed towards assessing on the efficacy of combinational methods [26, 27].

References

1. Green NM, Brull SJ, Baltimore, Williams & Wilkins (1993) The cardiovascular system, Physiology of Spinal Anesthesia. 1993: 85-199.
2. Clark RB, Thompson DS, Thompson CH (1976) Prevention of spinal hypotension associated with Cesarean section. Anesthesiology 45: 670-674.
3. Tarkkila P, Isola J (1992) A regression model for identifying patients at high risk of hypotension, bradycardia and nausea during spinal anesthesia. Acta Anaesthesiol Scand 36: 554-558.
4. LevinA, DattaS, SegalS (2008) The effect of posture on hypotension after spinal anaesthesia for caeserian section. Anesthesiology 84: 10.
5. Norris MC (1987) Hypotension during spinal anesthesia for caesarean section: Does it affect neonatal outcome? Reg Anaesth 2: 191-193.
6. Cyna AM, Andrew M, Emmett RS, Middleton P, Simmons SW (2002) Techniques for preventing hypotension during spinal anaesthesia for caesarean section. Cochrane Database Syst Rev. 2002: CD002251.
7. Somboonviboon W, Kyokong O, Charuluxananan S, Narasethakamol A (2008) Incidence and risk factors of hypotension and bradycardia after spinal anesthesia for cesarean section. J Med Assoc Thai 91: 181-187.
8. Riley ET (2009) Spinal anesthesia for Caesarean delivery: keep the pressure up and don't spare the vasoconstrictors.

Br J Anaesth 92: 459-461.
9. Morgan PJ, Halpern SH, Tarshis J (2001) The effects of an increase of central blood volume before spinal anesthesia for caesarean delivery: a qualitative systematic review. Anaesth Analg 92: 997-1005.
10. Macarthur A, Riley ET (2007) Obstetric anesthesia controversies: vasopressor choice for postspinal hypotension during cesarean delivery. Int Anesthesiol Clin 45: 115-132.
11. Sanborn, Boys RJ, Rodeck C, Morgan B (1992) Maternal and fetal haemodynamic effects of spinal and extradural anaesthesia for elective caesarea section. Br J Anaesth 68: 54-59.
12. Cesur M, Alici HA, Erdem AF (2008) Spinal anesthesia with sequential administration of plain and hyperbaric bupivacaine provides satisfactory analgesia with hemodynamic stability in cesarean section. Int J Obstet Anesth 17: 217-222.
13. Visalyaputra S (2002) Maternal mortality related to anesthesia: can it be prevent? Siriraj Hosp Gaz 54: 533-539.
14. Ebner H, Barcohena J, Bartoshuk AK (1960) Influence of postspinal hypotension on the fetal electrocardiogram. Amer. J. Ob. & Gyn 80: 569-572.
15. Ueyama H, Yan Ling H, Tanigami H, Mashimo T, Yoshiya I (1999) Effects of crystalloid and colloid preload on blood volume in the parturient undergoing spinal anesthesia for elective cesarean section. ANESTHESIOLOGY 91: 1571-1576.
16. Wollman SB, Marx GF (1968) Acute hydration for prevention of hypotension of spinal anesthesia in parturients. ANESTHESIOLOGY 1968: 29.
17. Miller'sAnesthesia 7th ed. 1 & 2.
18. Marx GF, Cosmi EV, Wollman SB (1969) Biochemical status and clinical condition of mother and infant at cesarean section, ANESTH. ANALG 48: 986-994.
19. Burns SM, Cowan CM, Wilkes RG (2001) Prevention and management of hypotension during spinal anaesthesia for elective Caesarean section: a survey of practice. Anaesthesia 56: 794-798.
20. Keith G Allman, Iain H Wilson Oxford hand book of anaesthesia.
21. Cousins MJ, Bromage PR, spinal blockade. In: Cousins MJ, Bridenbaugh PO (1988) Neural blockade in clinical anesthesia and management of pain. 2nd ed. Philadelphia: Lippincott 1988: 277-283.
22. Wilkening RB, Meschia G (1983) Fetal oxygen uptake, oxygenation, and acid-base balance as a function of uterine blood flow. Am J Physiol 244: 749-755.
23. Kinsella SM, Tuckey JP (2001) Perioperative bradycardia and asystole: relationship to vasovagal syncope and the Bezold-Jarisch reflex. Br J Anaesth 86: 859-868.
24. Smiley RM (2005) Fast Fourier transforms as prophecy: predicting hypotension during spinal anesthesia. Anesthesiology 102: 179-180.
25. Gelman S (2008) Venous function and central venous pressure: a physiologic story. Anesthesiology 108: 735-748.
26. Sharwood Smith G, Drummond GB (2009) Hypotension in obstetric spinal anaesthesia: a lesson from pre-eclampsia. Br J Anaesth 102: 291-294.
27. Gelman S, Mushlin PS (2004) Catecholamine-induced changes in the splanchnic circulation affecting systemic hemodynamics. Anesthesiology 100: 434-439.