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An Observational Study of Proportion and Risk Factors of Hypotension in Parturients Undergoing Spinal Anaesthesia for Caesarean Section

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Abstract
Background: *Spinal Anaesthesia (SA) is the most common preferred anaesthesia technique for Caesarean section (CS), because of its superior analgesia, favourable relaxation and decreased risk of complications over general anaesthesia[1,2,3,4]. Incidence of hypotension after spinal anaesthesia is highest in Caesarean section, and it can be significantly severe so that it can jeopardize the mother and foetus[5,6,7,8,9,10,11,12,13]. So early detection and prevention of hypotension is of atmost importance for better maternal and foetal outcome. This study aim to assess the incidence of spinal anaesthesia induced hypotension in parturients and confirm the existing risk factors and also to identify new risk factors if any in a population, where published studies are nil.*
Methods: *After obtaining approval from Research committee and institutional ethical committee a total of 200 patients who satisfied the inclusion and exclusion criteria were included in the study and evaluated for the development of hypotension after spinal anaesthesia. The population was divided in to two groups with and without hypotension after spinal anaesthesia for Lower segment caesarean section (LSCS). The two groups were then compared with respect to their demographic, maternal, anaesthetic and foetal variables to see whether any association exist with the development of maternal hypotension.*
Results: *In the present study the proportion of hypotension following spinal anaesthesia for CS was 54.5% (109/200). Univariate analysis identified 3 maternal risk factors such as age>30 years, ASA class II, and BMI>30kg /m^2. Anaesthesia related variable identified was sensory block height ≥ T5.Neonatal birth weight >2.5.kg was found as the significant foetal variable.*
Conclusion: *The incidence of maternal hypotension in the parturient after SA still remains high. Knowledge of the incidence and risk factors as well as timely intervention will definitely contribute to early detection and prevention of severity maternal hypotension.*
Keywords: *Spinal anaesthesia (SA), Caesarean section (CS), Hypotension, Risk factors.*

Introduction

Numerous research studies show that hypotension associated with spinal anaesthesia has its highest incidence in parturients because of the added unique anatomic and physiological changes in pregnancy[11,12,13,14]. It is referred to as the Holy Grail of obstetric anaesthesia[23]. Severe maternal hypotension can cause cardiac arrhythmias and even cardiac arrest. It can cause comparable fall in uterine blood flow and placental perfusion leading to foetal hypoxia and acidosis depending upon the severity and duration of hypotension[8,9,10]. A number of factors like increasing maternal age, BMI and sensory analgesia ≥T5 were significantly associated with maternal hypotension in the existing studies[11,13,14]. Neonatal birth weight, multi parity, volume of local anaesthetic drug, estimated blood loss are also identified as risk factors in various studies[15,19,].

Spectrum of morbidity with hypotension following SA include higher incidence of nausea and vomiting, aspiration, dizziness, syncope, cardiac arrhythmias and cardiac arrest in mother[15,16,17]. The catastrophic effect of hypotension can also cause severe adverse effects in foetus due to reduced placental perfusion causing prolonged foetal acidosis, low APGAR score, apnoea, weak reflexes and permanent neurological damage.

By identifying those at increased risk for hypotension would enable the anaesthetist to make adequate steps to prevent incidence and severity of maternal hypotension.

Objective

Primary Objective: To study the proportion and risk factors of hypotension in parturients during spinal anaesthesia following Caesarean section.

Secondary Objectives: To identify maternal and neonatal complications like maternal bradicardia, apnoea, hypoxia or cardiac arrest. The neonate will be assessed with Apgar score for any lowering of the score.

Materials and Methods

This study was a prospective observational study conducted in the department of Anaesthesiology at a tertiary care centre after obtaining approval of the Research Committee and Institutional Ethical Committee. Duration of the study was 6 months (Feb 2014-July 2015). 200 parturients who underwent elective or emergency CS under spinal anaesthesia were included.

Inclusion criteria- All parturients who underwent elective or emergency CS under spinal anaesthesia during the study period.

Exclusion criteria-

1. Short parturients with height < 140cms.
2. Incomplete block or partial block (failed spinal anaesthesia)
3. History of drug allergy to local anaesthetic drug.
4. ASA III and IV

Written informed consent to take part in this study was obtained from those parturients.

Study Variables

Primary Outcome variable:

Maternal hypotension: which is defined as lowest intra operative systolic blood pressure <100 mm of Hg. or decrease to 80% of base line value[21].

Maternal variables:

Age, BMI, parity, nature of surgery (emergency or elective) ASA physical status (I & II)

Anaesthesia related variables:

Intra venous fluid (IVF) therapy (pre-loading or co-loading), position of patient for SA (lateral /sitting), volume of local anaesthetic used, sensory block level, estimated blood loss.

Neonatal variables:

Gender of the new born, neonatal birth weight and order of pregnancy.

Preoperative evaluation, preparation, anaesthesia technique, and monitoring were according to the institutional protocol. Data's were collected and recorded by the principal investigator.

Statistical Analysis

Data was analysed by SPSS version 16. A case control analysis was done to identify the risk factors of maternal hypotension. The p-value is used for identifying statistical significance; p-value<.05% is taken as statistically significant.

Univariate analysis was done to identify the potential risk factors and was expressed as OR (odds ratio with 95%Confidence interval). Multivariate analysis was done to identify independent risk factors

Results

Frequency distribution of maternal hypotension was as following

Table 1

Hypotension	Frequency	Percent
Yes	109	54.5
No	91	45.5
Total	200	100.0

Among the study population 54.5% (109/200) of parturients developed hypotension following spinal anaesthesia.

Maternal variables

Table 2: Comparison of two groups by maternal variables

Maternal Variables		Hypotension				Total (N=200)		χ^2	p-value	OR (95% CI)
		Present (N=109)		Absent (N=91)						
		N	%	N	%	N	%			
Age (in yrs)	>30	39	35.8	18	19.8	57	28.5	6.23	0.013	2.260 (1.182- 4.318)
	<30	70	64.2	73	80.2	143	71.5			
Parity	Primi	20	18.3	24	26.4	44	22.0	1.861	0.172	-
	Multi	89	81.7	67	73.6	156	78.0			
BMI(kg/m$^{2)}$	Obese ≥30kg/m^2	31	28.4	13	14.3	44	22	5.791	0.016	2.385(1.161-4.897)
	Over Weight 25-29kg/m^2	78	71.6	78	85.7	156	78			
ASA	ASA 2	69	63.3	41	45.1	110	55	6.672	0.01	2.104(1.192- 3.713)
	ASA 1	40	36.7	50	54.9	90	45			
Nature of surgery	Elective	47	43.1	29	31.9	76	38	2.665	0.103	
	Emergency	62	56.9	62	68.1	124	62			

According to Univariate analysis age ≥ 30years was associated with maternal hypotension which is statistically significant (OR 2.260 with 95% CI 1.182-4.318). Parturients with BMI≥30 have statistically significant association (OR 2.385 with 95% CI 1.161-4.897). ASA class II is also statistically significant (OR 2.104 with 95% CI 1.192-3.713).

Anaesthesia related variables

Table 3: Comparison of two groups by Anaesthesia related variables

Anaesthesia related Variables		Hypotension				Total (N=200)		χ^2	p-value	OR (95% CI)
		Present (N=109)		Absent (N=91)						
		N	%	N	%	N	%			
IVF therapy Preload/co-load	preload	55	50.5	53	58.2	108	54	1.209	0.73	
	co-loading	54	49.5	38	41.8	92	46			
Position of Patient for SA	latteral	108	99.1	90	98.9	198	99			
	Sitting	1	0.9	1	1.1	2	1	0.016	0.898	
Volume (Dose) of .5% bupivacaine (H)	<2ml/10mg	29	26.6	34	37.4	63	31.5			
	≥2ml/10mg	80	73.4	57	62.6	137	68.5	2.660	0.103	
Sensory Block level	T4 & T5	83	76.1	56	61.5	139	69.5			
	T6	26	23.9	35	38.5	61	30.5	4.993	0.025	1.995 (1.084-4.318)
Estimated Blood Loss (ml)	>500ml	64	58.7	65	71.4	129	64.5	3.501	0.061	

Sensory block level ≥T5 showed significant association with maternal hypotension (OR 1.995, 95% CI 1.084-4.318). Other variables didn't show significant association with maternal hypotension.

Table 4: Comparison of two groups by foetal related variables

Foetal related Variables		Hypotension				Total (N=200)		χ^2	p-value	OR (95 CI)
		Present (N=109)		Absent (N=91)						
		N	%	N	%	N	%			
Gender	Male	60	50.0	41	43.6	101	47.2			
	Female	60	50.0	53	56.4	113	52.8	0.862	0.353	-
Neonatal Birth weight	<2.5kg	53	44.2	21	22.3	74	34.6			2.750
	≥2.5kg	67	55.8	73	77.7	140	65.4	11.100	0.001	(1.502- 5.033)
Order of pregnancy	Single	102	80.9	84	100	186	93			
	> Single	14	19.9	0	0	14	7	*	0.0004	

*Applied Fisher exact test statistics.

Birth weight ≥2.5kg has significant association with maternal hypotension (OR 2.750, 95% CI 1.5022-5.033). Order of pregnancy with >single has significant association (p-value .0004)

Logistic Regression

Binary logistic regression done to determine the independent variables

Table 5: Multivariate analysis

Variables	B	S.E	P	OR	95% C.I for OR	
					Lower	Upper
Age	0.841	0.349	.016	2.319	1.169	4.600
Nature of surgery	0.502	0.595	.398	1.653	.515	5.304
BMI	0.714	0.396	.071	2.041	.940	4.435
Sensory Block level	0.702	0.333	.035	2.018	1.050	3.877
IVF therapy	0.564	0.573	.325	1.759	.572	5.406
ASA physical status	0.782	0.324	.016	2.186	1.157	4.129
Neonatal birth weight	0.812	0.322	.011	2.81	1.211	4.328
Constant	-5.830	2.009	.004	.003		

4 variables such as Age, ASA II physical status , sensory block level and neonatal birth weight ≥ 2.5kg are independently associated with maternal hypotension after SA.

Foetal outcome

Assessed by APGAR scoring system[22]. Total 214 new born babies were in the study including twin pregnancies.

Comparison of new born babies of two groups with APGAR scoring at 5 minutes.

Table: 6

APGAR @ 5 min	Hypotension				Total	
	Yes		No			
	N	%	N	%	N	%
≤ 8	8	6.7	12	12.8	20	9.3
> 8	112	93.3	82	87.2	194	90.7
Total	120	100.0	94	100	214	100

χ^2 = 2.314 df= 1 p= 0.124

In our study there was no statistically significant difference in foetal outcome between those with hypotension and without hypotension.

Discussion

Pregnant women can be considered as special population where incidence of hypotension following central neuraxial blockade is higher because of the unique anatomical and physiological alteration that occur during pregnancy period. Severe maternal hypotension cause cardiac arrhythmias and even cardiac arrest in mother. It can also cause severe adverse effects in foetus following foetal hypoxia and acidosis. Thus prevention of severe hypotension is of at most importance for a favourable maternal and foetal outcome. By assessing the risk factors we can predict which patient would develop maternal hypotension and may also enable adequate preparations and selectively alter treatment regime.

Our study was conducted in a tertiary care centre. In this study 200pregnent women posted for caesarean section under SA who fullfilled the inclusion and exclusion criteria were divided in to two groups with and without hypotension after spinal anaesthesia for LSCS. The criteria for definition of hypotension used was lowest intra operative systolic blood pressure <100mm of Hg or fall to 80% of base line value. In our study the proportion of hypotension following spinal anaesthesia was 54.5% (109/200). In a similar prospective study by Pitchya Ohpasanon et al in 2004 July with 807 parturients showed 65.1% incidence of maternal hypotension[13]. The criteria for definition of hypotension used was similar to that in our study. A prospective study by Chumpathong et al in 2006 including 991 parturients showed an incidence of maternal hypotension as 76%[14]. In a cross sectional study by Somboonviboon et al the incidence was 52.6%. In a data analytical study by Brenck and Hartman et al with 503 parturients incidence of maternal hypotension was 56.5%[33].

In the parent study by Pitchya Ohpasanon et al maternal age ≥ 35 years has significant association (OR 1.6 with narrow CI). Study by Chumpathong et al identified age >30years as non modifiable risk factor (OR 1.62 with narrow CI interval). In our study increase in maternal age >30years was statistically significant association with maternal hypotension (OR 2.260, 95% CI 1.182-4.318) and is consistent with above studies. According to our study BMI (body mass index)> 30 was identified as a non modifiable risk factor (OR 2.385 95% CI 1.161-4.897). Study by Pitchya Ohpasanon et al also identified BMI as non modifiable risk factor (OR 2.83, 95% CI 1.312-6.11). In another study by KyoKong et al BMI ≥30 (OR 1.534, 95% CI 1.20-2.160) is significantly related to hypotension[11]. In our study parity showed no statistically significant association with maternal hypotension. But ASA II physical status was statistically significant (OR 2.104, 95% CI 1.192-

3.713). Study by Pitchya Ohpasanon et al ASA II status showed increase incidence but values observed are statistically insignificant.

Among the anaesthesia related variables intravenous fluid therapy either by preloading or coloading didn't show significant relation with maternal hypotension . The requirement of dose of vasopresser was almost the same in both groups. Our study correlated with randomised comparative study of crystalloid pre loading versus co-loading in parturients by Krishna HM Bose M et al[20]. Dose of local anaesthetic Inj.5% Bupivacaine (Heavy) ranged from 1.4-2ml (7-10mg) and the dose didn't show significant relations in our study. Theoretically dose of LA and total volume should affect the severity of hypotension, but we could not confirm this in the study because of the narrow range of drug dosage. Prospective study by Chinachoti T, et al showed high dose of Bupivacaine (H) ≥ 2ml as modifiable risk factor with OR 1.88(95% CI 1.32-2.74)[12]. In our study sensory block level ≥T5 showed statistically significant relation (OR 1.995, 95% CI 1.084-4.318). Pitchya Ohpasanon et al also observed similar result with sensory level > T5 (OR 1.55, 95% CI 1.12- 2.15). Chumpathong et al identified analgesia level > T5 (OR 1.83, 95% CI 1.18-2.84). Study by Chinachoti T, et al identified with similar observation with (OR 2.27, 95% CI 1.73-2.97). Study by Kyo kong et al also showed analgesia level > T4 dermatome (OR 2.068, 95% CI 1.486-2.879) as a risk factor. Estimated blood loss ≥ 500ml didn't observe significant association in this study. In the study by Somboonbiboon et al in 2008 with 722 patients estimated blood loss > 500ml with (OR 1.86, 95% CI 1.30-2.67, p 0.001) is significantly associated with hypotension[15].

In the foetal variables studied; Birth weight >2.5kg has significant association with maternal hypotension (OR 2.75, 95% CI 1.502-5.033). Our study co-related with data base study by Brenck and Hartman et al[19]. In our study order of pregnancy is also a significant risk factor (p-value 0.0004).

Our study identified the following potential risk factors by Univariate analysis.

Maternal variables: age >30 yrs, BMI>30kg/m^2 and ASA II physical status.

Anaesthesia related variables: sensory block level ≥ T5

Foetal variables: neonatal birth weight > 2.5kg, and order of pregnancy >single.

With binary logistic regression 4 independent variables were identified and they are maternal age >30, sensory block level ≥ T5 and ASA 2 physical status, neonatal birth weight >2.5kg. These variables can be used for model building to predict maternal hypotension.

We tried to correlate maternal hypotension with neonatal out come by assessment with APGAR scoring[22]. 59.2% of newborns of mothers with maternal hypotension had score <8 at one minute and the score improved to >8 in 93.3% newborns of hypotension group. There was no statistically significant different between two groups. Our study showed a better foetal outcome with 99.1% babies had score of >8 at 5 minutes.

Conclusion

The major observations of the study are

1) 54.5% of the study population developed maternal hypotension.
2) Age > 30 years, ASA II Physical status, sensory block level ≥ T5, neonatal birth weight >2.5kg were the four independent variables.
3) Even though the incidence of hypotension was 54.5% none of the baby in our study group with maternal hypotension had APGAR score < 8at 5 minutes

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Bibliography

1. Aboud TK, Nagappala S, Murakawa K, et al. Comparison of the effects of general and regional anaesthesia for caesarean section on neonatal neurologic and

adaptive capacity scores. Anesth Analg 1985; 64:996.
2. Shyken J M, et al. A comparison of the effect of epidural, general and no anaesthesia on funic acid-base value of stage of labour and type of delivery. Am J Obstet Gynecol 1990; 163:802.
3. Hodgkinson R, Batt M, Kim SS, et al. Neonatal neurobehavioral tests following caesarean section under general and spinal anaesthesia. Am J Obstet Gynecol 1978; 132:670.
4. HS, Merhej A, Dabbas MA, Hindawi IM. Spinal versus general anaesthesia for elective caesarean delivery: a prospective comparative study. Clin Exp Obstet Gynecol 2001; 246-8.3.
5. Juhani TP, Hannele H. Complications during spinal anaesthesia for caesarean delivery: a clinical report of one year's experience. Reg Anesth 1993; 18:128.
6. Schinider and Levinsons Text book of obstetric anaesthesia. 1,3-15.
7. Ronald. D. Millers anaesthesia 7th edin-obstetric anaesthesia .
8. Corke BC, Datta S Ostheimer GW, et al. Spinal anaesthesia for caesarean section: the influence of hypotension on neonatal outcome. Anaesthesia 1982; 37:658.
9. Robson SC Samson G Boys RJ, Rodek C Morgen B. Incremental spinal anaesthesia for elective caesarean section; maternal and fetal haemodynamic effects. Br J of Anaesthesia 1993; 70(6):634-638.
10. Robson SC, Boy RJ, Rodek C, Morgen B. Maternal and fetal haemodynamic effect of spinal and extradural anaesthesia for elective caesarean section. Br J Anaes. 1992; 68(1): 54-59.
11. Kyokong and Charulaxanan et al incidence and risk factors of hypotension and bradycardia associated with spinal anaesthesia.
12. Prospective study of hypotension and bradycardia during spinal anaesthesia with bupivacaine: incidence and risk factors, part two, JMed Assoc Thai 2007 March 90:492-501.
13. Ohpasanon P, Chinachoti T, Sriswasdi P, Srichu S. Prospective study of hypotension after spinal anesthesia for caesarean section at Siriraj Hospital incidence and risk factors, part 2. J Med Assoc Thai 2008; 91: 675-80.
14. Parent study of incidence and risk factors of hypotension after Spinal Anesthesia for Caesarean Section -2004 at Siriraj Hospital. J Med Assoc Thai 2006 Aug 89(8)1127-32. Chumpathong et al.
15. Somboonviboon W, Kyokong O, Charuluxananan S, Narasethakamol A. Incidence and risk factors of hypotension and bradycardia after spinal anesthesia for caesarean section. J Med Assoc Thai 2008; 91:181-7.
16. Juhani TP, Hannele H. Complication during Spinal anesthesia for cesarian delivery: a comparison of two doses. Reg Anesth 1995; 20:90.
17. Roberts SW, Leveno KJ, Sidawi JE, et al. Foetal acidemia associated with regional anesthesia for elective caesarean delivery. Obstet Gynecol 1995; 85:79.
18. Cousins and Bridenbaughs 4th edin.24; 532-563.
19. Hypotension after spinal anesthesia for caesarean section: identification of risk factors using an anaesthesia information management system:- Journal of clinical monitoring and computing (2009) 23:85-92 BRenck and Hartmann et al.
20. Bose M, Kini G, Krishna HM. Comparison of crystalloid preloading versus crystalloid co-loading to prevent hypotension and bradycardia following spinal anaesthesia. J Obstet Anaesth Crit Care 2012; 2:10-5.
21. Kiohr. S and Roth et al. Definition of hypotension after spinal anaesthesia for caesarean section literate research. Acta

Anaesthesiologic a Scandinavica 2010**;** 54-909-21.

22. Apgar, Virginia(1953).”A proposal for a new method of evaluation of the new born infant”. Curr.Res.Anesth.Analg.32 (4)**:**260-267. PMID 13083014.
23. Mar Carthur. A etal.Solving the problem of spinal induced hypotension in obstetric anaesthesia.Can.j.Anae:2002,49;536-9.