Original Article

Comparison of Intravenous Versus Oral Fluid for Prophylaxis of Maternal Hypotension During Cesarean Section Under Spinal Anesthesia

Saira Mahboob[1], Ayesha Haroon[2], Ambreen Ehsan[3], Maria Ikram[4], Safoora Saba Masood[5], Tariq Mehmood[6]

[1]Consultant Anesthetist PNS RAHAT Karachi, [2,5]Consultant Gynecologist PNS RAHAT Karachi, [3]Associate Professor CMH Medical College Lahore, [4]Student (A Levels) International School of Lahore, [6]Professor Anesthetist PNS Shifa / BUMDC, Karachi

Correspondence: *Dr. Saira Mahboob*
Consultant Anesthetist PNS RAHAT Karachi
saira.mahboob.md@gmail.com

Abstract

Objective: To assess the effectiveness of oral versus intravenous fluid for prophylaxis of maternal hypotension after spinal anesthesia for elective cesarean section.

Methodology: Departments of Anesthesiology and Gynecology & Obstetrics, Rahat Hospital Karachi for 08 months from 1st March 2023 to 31th October, 2023. After the approval of hospital ethical committee, 120 patient (n=60) undergoing elective cesarean section were divided into two groups by lottery method. Group A were 300ml oral potable water given; whereas group B were given 10 ml/kg intravenous Lactated Ringer's solution at 2-4 hours preoperatively. Our primary outcomes were: frequency of maternal hypotension. The secondary outcomes were: intra-operative changes in blood pressure, heart rate and interventions required for treatment of maternal hypotension. SPSS version 23 was used to data analysis.

Results: A total of 120 (n=60 in each group) patient had at least one episode of hypotension. Both oral and intravenous fluid was effective in preventing hypotension 5 (8.3%) versus 2 (3.3%); p=0.439. 5 (8.3%) required rescue phenylephrine bolus to treat hypotension; p=0.923. 7 (11.6%) patient complaints of nausea in group A versus 2 (3.3%) in group B; p=0.323. The systolic and diastolic blood pressure as well as heart rate remained comparable till 60 minutes; p-value> 0.05

Conclusion: Oral and intravenous fluid given at 02-04 pre-operatively in elective cesarean section were comparable in regards to prevention of maternal hypotension under spinal anesthesia.

Keywords: cesarean section, hypotension, prophylaxis, spinal anesthesia.

Cite this article as: Mahboob S, Haroon A, Ehsan A, Ikram M, Masood SS, Mehmood T. Comparison of Intravenous Versus Oral Fluid for Prophylaxis of Maternal Hypotension During Cesarean Section Under Spinal Anesthesia. J Soc Obstet Gynaecol Pak. 2024; 14(2):68-71.

Introduction

Maternal hypotension has been reported in 10-70% during spinal anesthesia for cesarean delivery. Various prophylactic and therapeutic measure are recommended to manage maternal hypotension and adverse neonatal outcomes. These include left uterine tilt, 15-degree Trendelenburg position, crystalloid fluid therapy and vasopressors.[1] In addition, American Society of Anesthesiologists has recommended various evidence-based practices to improve patient outcomes including minimizing pre-operative fasting. The Early Recovery After cesarean section (ERAC) guidelines have been formulated for the peri-operative care of cesarean section. ERAC guidelines commend optimization of comorbidities during pregnancy and limit the fasting time preoperatively as well as oral fluid till two hours pre-operatively. The emerging trend is to administration glucose 20 gm at two hours pre-operatively.[2,3,4] Iljiri E *et al*. reported no difference in the gastric volume of pregnant women who were given 500ml ORS before bedtime, ORS or mineral water two hours before surgery or no water at 2 hours preoperative.[5] Globally, the pregnant women are kept nothing per oral 6-8 hours for solids and 2 hours for clear fluids pre-operatively. However, the perception amongst surgical patient is still to remain NPO after midnight which unnecessarily prolong this time period resulting in dehydration. Even in developed countries,

Authorship Contribution:[1,5]Substantial contributions to the conception or design of the work or the acquisition, Final approval of the version to be published. [2,3,6]Drafting the work or revising it critically for important intellectual content, [4]Literature search, editing.

Funding Source: none
Conflict of Interest: none

Received: Jan 11, 2024
Accepted: May 29, 2024

pregnant women are kept for longer duration. Mackenzie M et al reported a median NPO time of 12.6 hours (10.9- 14 hours) at Chelsea and Westminter Hospital London.[6] Studies have shown that oral fluid intake up to two hours preoperative period to reduces insulin resistance, thirst, hunger, anxiety as well as creates better glycemic control and anabolic state after abdominal surgery.[7] Intravenous fluid for prevention of maternal hypotension has been extensively been studied. The meta-analysis and systemic reviews have shown no difference in the incidence or severity of maternal hypotension whether pre-load vs co-load or when crystalloid versus colloid were compared. However, the authors could not find any published article used to compare hemodynamic stability after oral versus intravenous pre-load.

The objective of this study was to compare oral mineral water with intravenous fluid pre-loading for prevention of maternal hypotension during spinal anesthesia for cesarean section.

Methodology

After the approval of the hospital (RAHAT-23-01); this randomized control trial was conducted at Departments of Anesthesiology and Gynecology & Obstetrics, Rahat Hospital, Karachi for a duration of eight months from 1st March to 31st October, 2023. WHO sample size calculator was used to calculate a sample size of 106 with expected incidence of hypotension (7.4%); power=80% and Confidence Interval 95%.[8] We included 120 pregnant women (n=60 in each group) with age greater than 18 years, with singleton pregnancy, American Society of Anesthesiologist (ASA) physical status class ≤ III who were undergoing elective cesarean section. The participants were divided into two groups by lottery method. Patients with ongoing nausea, vomiting or gastroparesis were excluded from the study. The pre-anesthesia assessment was done as per institute protocol and no changes were made for study. The patients were counselled regarding method of anesthesia and consent was taken. On the night prior to surgery, intravenous line with 18G cannula was maintained with Lactated Ringers solution. Patient were kept nothing per oral at least 6 hours. On the day of surgery, group A was given 400ml water per oral at 2-4 hours pre-operatively; whereas, Group B was given 10ml/ kg Lactated Ringers solution at 2-4 hours pre-operatively. In operation theater, ASA Standard I and II monitoring was started with electrocardiography, non-invasive blood pressure, SpO2 and heart rate. The participants were given spinal anesthesia with 1.8 ml 0.75% hyperbaric bupivacaine at L3-4 or L2-3 level under complete aseptic measure. The patients were given left uterine tilt, 15 degrees Trendelenburg position, co-load with Ringers lactate solution, prophylactic phenylephrine infusion with 150 microgram / 500ml crystalloid over 30 minutes to prevention of maternal hypotension. The surgery was started after confirming sensory level of T4. The primary outcomes were: prevention of hypotension and thirst severity. The secondary outcomes were: hemodynamic stability and frequency of side effects of spinal anesthesia. The thirst severity was assessed using “Thirst Distress Score”.[9] Maternal hypotension was taken as > 20% drop in blood pressure or < 90 mm Hg systolic blood pressure. It was treated with IV phenylephrine 50 ug bolus dose. Maternal bradycardia was taken as heart rate < 60 bpm and IV atropine 0.5mg was given.

The data was collected on a predesigned proforma. The data was analyzed using IBM SPSS version 23. Mean ± standard deviation (SD) was used to present the quantitative data. Independent sample t-test was used to analyze statistical significance. Frequency and percentage were used to describe the qualitative data. Chi-square was used to calculate correlation. p value ≤ 0.05 was taken as significant.

Results

A total of 120 participants were included in our study. The mean age of the pregnant women of our study population was 28.06± 5.22 years and the mean NPO (nothing per oral) was 10.09± 3.86 hours. 38 (31.7%) in group were ASA physical status class II versus 34 (28.3%) in class III in group B; p=0.501. Most 35 (29.2%) were multiparous in group A versus 41 (34.2%) in group B; p=0.210. The comparison of demographic profile is shown in table I.

Both groups had 113 (94.2%) effective prevention of maternal hypotension and only 7 (5.8%) patients had at least one episode of hypotension.

There was no statistical difference between the two groups in regards to systolic blood pressure (SBP), diastolic blood pressure (DBP) and heart rate (HR) at baseline, 10, 30, 45 and 60-minutes post-induction of spinal anesthesia. The systolic blood pressure was higher (116.92± 15.50 mm Hg) in group A versus 113.39± 18.84 mm Hg in group B at 60 minutes of initiation of spinal anesthesia; p-value 0.024. The mean SBP, DBP and HR are shown in table III.

There was difference in thirst severity in either group: 25 (41%) severe thirst in oral group versus 33 (55.9%) in intravenous group; p=0.180. Similarly, there was no difference in effect of thirst severity on frequency of maternal hypotension in both groups: 3 (42.9%) in severe thirst; 2 (28.6%) in mild and no thirst patients; p=0.809.

Discussion

Our study has shown 94.1% effective prevention of maternal hypotension. There was no difference in patients' outcomes compared between the two groups. However, systolic blood pressure was 116.92± 15.50 mm Hg in oral versus 113.39± 18.84 mm Hg in IV group, p=0.024; which is statistically significant.

Early Recovery after Surgery protocol are being implemented for elective cesarean section globally for better maternal and neonatal outcomes. These include evidence-based practices that span over the per-operative periods. The nothing per oral (NPO) of 8 hours for fatty meals, 6 hours for light meals and clear fluids till 02 hours are recommended.[10] Dehydration due to prolonged NPO can lead to hypovolemia, increased stress response and higher post-operative pain scores. Allowing fluid till 2 hours pre-operatively reduces peri-operative hunger and thirst, pain as well as improve patient satisfaction.[11,12,13] Authors have shown better outcomes with oral and glucose loading prior to cesarean section in terms of reduced urine ketosis; improve analgesia and patient satisfaction.[14,15,16] According to authors knowledge, no studies have compared the utility of 2 hours fluid load versus intravenous fluid for prophylaxis of maternal hypotension in cesarean section under spinal anesthesia.

The post-operative early oral intake has been shown to be beneficial for return of bowel movement, better post-operative analgesia, shorter hospital stay and improved patient satisfaction.[3,17] Limited studies are available that compare pre-operative oral and intravenous fluid for maternal outcomes. Iljiri E *et al.* Studied 51 pregnant (n=17 in each group) undergoing elective cesarean section. They reported that total number of

Table I: Comparison of Demographic Profile Between Study Groups.

Variable		Group A (Oral) n=60	Group B (IV) n=60	p-value
Age (years)	Mean ± SD	27.81± 5.30	28.33±5.48	0.613
Nothing per oral duration (hours)	Mean ± SD	9.38± 4.04	10.82± 3.54	0.073
Surgical time (minutes)	Mean ± SD	50.17± 15.05	48.96± 15.69	0.841
Estimated blood loss (milli-liters)	Mean ± SD	348.82± 100.80	397.29± 101.34	0.712
Intra-operative fluid (milli-liter)	Mean ± SD	1732.20± 412.07	1705.26± 401.07	0.645

Table II: Comparison of outcomes in two study groups.

Variable		Group A (oral) n=60	Group B (IV) n=60	p-value
Hypotension		5 (4.2%)	2 (1.7%)	0.439
Bradycardia requiring atropine		10 (8.3%)	8 (6.7%)	0.799
Rescue Phenylephrine bolus		5 (4.2%)	5 (4.2%)	0.923
Nausea / vomiting		7 (5.8%)	3 (2.5%)	0.323
Thirst	No	15 (12.5%)	8 (6.7%)	0.180
	Mild	21 (17.5%)	18 (15%)	
	Severe	25 (20.8%)	33 (27.5%)	

Table III: Comparison of p-value in hemodynamics.

Variable		Group A (oral)	Group B (IV)	p-value
Systolic blood pressure (mm Hg)	Baseline	131.25± 15.21	132.20± 16.31	0.676
	10 minutes	120.64± 14.91	118.67± 14.08	0.841
	30 minutes	118.33±14.07	119.71± 14.49	0.942
	45 minutes	119.04± 15.50	115.66± 11.27	0.368
	60 minutes	116.92± 15.50	113.39± 18.84	0.024
Diastolic Blood pressure (mm Hg)	Baseline	80.73± 11.63	82.35± 14.62	0.146
	10 minutes	71.40± 14.54	71.91± 13.78	0.915
	30 minutes	66.03± 12.17	69.79± 13.32	0.837
	45 minutes	67.55± 13.66	70.42± 9.75	0.321
	60 minutes	67.21± 10.70	71.69± 11.43	0.697
Heart rate (bpm)	Baseline	94.32± 10.70	93.50± 13.53	0.491
	10 minutes	93.25± 16.11	93.94± 16.47	0.325
	30 minutes	91.35± 13.85	90.66± 11.19	0.645
	45 minutes	89.72± 11.36	89.78± 10.75	0.704
	60 minutes	90.70± 12.47	88.60± 11.06	0.899

rescue phenylephrine boluses was higher in 3 doses in control (NPO>8hours) versus 2 doses in mineral water and 1 dose in oral rehydration solution group; p=0.009. similarly, higher dose of phenylephrine was used in control (300µg); mineral water (100µg) and ORS (100µg); p=0.017. However, they reported comparable results regarding maternal venous glucose, sodium, intra-operative blood loss, total intravenous fluid and operative times. Similarly, the umbilical pH was comparable in the three groups.[5] The intra-operative fluid used by them was much lower (1200-1300ml) as compared to our study (1500-2500ml). The surgical time were slightly longer (56-58 minutes) than our study (35-75 minutes). However, they did not study hemodynamic parameters in their study or other side effects of spinal anesthesia.

Our study has also shown that the frequency of nausea, vomiting and the feeling of thirst were comparable in both groups. This may be due to us achieving euvolemia pre-operative. The mean pre-operative NPO time was longer than 9 hours in both our groups. This may be due to the fact that NPO after 12 midnight is still being practiced by patient and nursing staff as well as longer elective cesarean section lists. We did not compare oral fluid against the control of NPO of 6-8 hours pre-operative, as is most frequently observed in studies comparing pre-operative fluid.

Conclusion

Oral and intravenous fluid given at 02-04 pre-operatively in elective cesarean section were comparable in regards for prophylaxis of maternal hypotension and other side effects during elective cesarean section under spinal anesthesia.

References

1. Chooi C, Cox JJ, Lumb RS, Middleton P, Chemali M, Emmett RS, Simmons SW, Cyna AM. Techniques for preventing hypotension during spinal anaesthesia for caesarean section. Cochrane Database Syst Rev. 2017;8(8):CD002251. doi: 10.1002/14651858.CD002251.
2. Ogunkua O. Enhanced Recovery After Cesarean Section. Contemporary OB / GYN.2021;66(5). https://www.contemporaryobgyn.net/view/enhanced-recovery-after-cesarean-section
3. Patel K, Zakowski M. Enhanced Recovery After Cesarean: Current and Emerging Trends. Curr Anesthesiol Rep. 2021;11(2):136-144. doi: 10.1007/s40140-021-00442-9.
4. Ituk U, Habib AS. Enhanced Recovery after Cesarean Delivery. F1000Res.2018;27:7:F1000 Faculty Rev-513. doi: 10.12688/f1000research.13895.1.
5. Ijiri E, Mori C, Sasakawa T. Effect of preoperative oral rehydration before cesarean section on ultrasound assessment of gastric volume and intraoperative hemodynamic changes: a randomized controlled trial. BMC Anesthesiol. 2023;23(1):293. doi: 10.1186/s12871-023-02250-6.
6. Mackenzie M, Yentis S, Woolnough M and Johnson M. Fasting period and dehydration before elective cesarean section. Anaestehsia.2010;5:94-113. Available at: https://associationofanaesthetists-publications.onlinelibrary.wiley.com/doi/pdf/10.1111/j.1365-2044.2009.06184_7.x
7. 7 Practice Guidelines for Obstetric Anesthesia: An Updated Report by the American Society of Anesthesiologists Task Force on Obstetric Anesthesia and the Society for Obstetric Anesthesia and Perinatology. *Anesthesiology.* 2016;124(2):270–300. 10.1097/ALN.0000000000000935
8. Šklebar I, Bujas T, Habek D. SPINAL ANAESTHESIA-INDUCED HYPOTENSION IN OBSTETRICS: PREVENTION AND THERAPY. Acta Clin Croat. 2019;58(Suppl 1):90-5. doi: 10.20471/acc.2019.58.s1.13..
9. Carey D, Waller J, Wang LY and Ferrie S. Qualifying thirst distress in acute hospital setting- validation of a patient-reported outcome measure. Journal of Perioperative Nursing.2021;34(4):6. DOI: 10.26550/2209-1092.1156
10. Patel K, Zakowski M. Enhanced Recovery After Cesarean: Current and Emerging Trends. Curr Anesthesiol Rep. 2021;11(2):136-144. doi: 10.1007/s40140-021-00442-9..
11. Bopp C, Hofer S, Klein A, Weigand MA, Martin E, Gust R. A liberal preoperative fasting regimen improves patient comfort and satisfaction with anesthesia care in day-stay minor surgery. Minerva Anestesiol. 2011;77(7):680-6.
12. Ogino Y, Kakeda T, Nakamura K, Saito S. Dehydration enhances pain-evoked activation in the human brain in comparison with rehydration Anesth Analg. 2014;118:1317–25
13. Ogunkua O. Enhanced Recovery after Cesarean Section. Contemporary OB/GYN journal. 2021;66(5): 16-9. Available at: https://www.contemporaryobgyn.net/view/enhanced-recovery-after-cesarean-section.
14. 14 Clark A, Litchfield K, Hannah S, Love C, Slade K, Lake K, Agaram R. Pre-operative carbohydrate loading prior to elective caesarean delivery: a randomized controlled trial. Int J Obstet Anesth. 2021;45:21-27. doi: 10.1016/j.ijoa.2020.10.008. PMID: 33277162
15. Roofthooft E, Joshi GP, Rawal N, de Velde MV et al. PROSPECT guideline for elective caesarean section: updated systematic review and procedure-specific postoperative pain management recommendations. Anaesthesia.2021;76(5):587-9
16. Wilson RD, Caughey AB, Wood SL, Macones GA, Wrench IJ, Huang J, Norman M, Pettersson K, Fawcett WJ, Shalabi MM, Metcalfe A, Gramlich L, Nelson G. Guidelines for Antenatal and Preoperative care in Cesarean Delivery: Enhanced Recovery After Surgery Society Recommendations (Part 1). Am J Obstet Gynecol. 2018;219(6):523.e1-523.e15. doi: 10.1016/j.ajog.2018.09.015. Epub 2018 Sep 18. PMID: 30240657.
17. Hassan M, Wahba KA, Islam BA. Early Versus Traditional Oral Hydration after cesarean section. EVIDENCE BASED WOMEN'S HEALTH SOCIETY.2022;12(1):1-7. DOI: https://doi.org/10.21608/ebwhj.2018.5098.1003.