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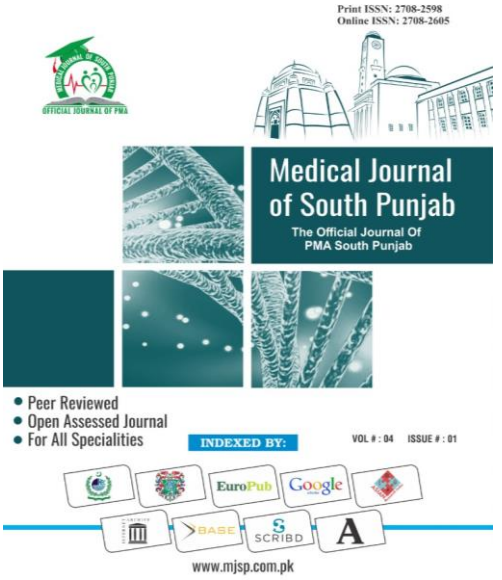

Frequency of hypotension in lumbar spinal anesthesia with prophylactic use of fluid Gelofusine versus Synephrine in women undergoing cesarean section

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Original Article

Frequency of hypotension in lumbar spinal anesthesia with prophylactic use of fluid Gelofusine versus Synephrine in women undergoing cesarean section

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ABSTRACT

Objective: *to assess the frequency of hypotension in women undergoing cesarean section under lumbar spinal anesthesia, with prophylactic administration of either fluid Gelofusine or Synephrine.*

Methods: *A randomized controlled trial was conducted at the Department of Anesthesiology, Nishtar Hospital Multan, from April 29th, 2019, to October 28th, 2019. The trial consisted of 120 participants, with 60 individuals allocated to each group. Patients were randomly assigned to either group A (prophylactic fluid preload) or group B (vasopressor) using sealed envelopes.*

Results: *The mean ages were 28.38 ± 5.90 years for group A and 28.97 ± 6.01 years for group B. Frequency of hypotension observed was 51.67% with use of fluid Gelofusine and 70.0% with Synephrine, as outlined in Table 2, with a statistically significant p-value of 0.040.*

Conclusion: *Gelofusine preload during the induction of spinal anesthesia for elective cesarean section demonstrates a lower frequency of hypotension compared to synephrine preload, suggesting its routine utilization in our general practice to prevent spinal-induced hypotension and effectively manage patients undergoing spinal anesthesia.*

Keywords: *spinal anesthesia, hypotension,Gelofusine preload, Synephrine, ceserean section*

1. INTRODUCTION

Spinal anesthesia is safe and effective alternative of general anesthesia particularly for surgeries involving the lower extremities, perineum, or lower body wall, offering excellent anesthesia and post-operative pain relief while being convenient, cost-effective, and easily implemented for procedures in the lower abdominal, pelvic, and lower limb regions[1,2].

Spinal anesthesia induces hypotension by blocking sympathetic outflow, often resulting in decreased blood pressure, cardiac contractility and heart rate, which can be controlled through patient pre-loading or administration of ionotropic and vaso-pressor drugs[3]. True allergies to local anesthetics are rare, with ester-based ones like tetracaine more commonly causing allergic reactions compared to amide-based options such as bupivacaine, simplifying the process of finding a suitable local anesthetic[4].

Hypotension, a common maternal complication of spinal anesthesia during cesarean section, exhibits a high incidence, potentially reaching 100%[5]. Factors independently associated with its early onset include BMI, age, diabetes mellitus, baseline heart rate, anemia, pulse pressure, blood pressure systolic and diastolic, sensory and motor blockade level and vascular overload[6].

Bills et al. propose that circulating VEGF-A levels in preeclampsia remain biologically active due to the loss of repression of VEGF-receptor 1 signaling by PlGF-1, while VEGF165 b may contribute to the increased vascular permeability observed in preeclampsia[7].

Various methods have been attempted to proactively decrease the occurrence and seriousness of hypotension, such as expanding intravascular volume with 2 liters of fluid[8], left lateral uterine displacement, and administering ephedrine intramuscularly or intravenously[9]. While fluid loading has demonstrated a reduction in hypotension risk, it does not entirely eradicate it and requires time to accomplish, with many patients still necessitating vasopressor treatment to address hypotension[10].

A study has not been conducted in Pakistan on this topic yet, but such a study would provide a valuable baseline database for our local population. The results of this study could assist anesthetists in implementing more effective prophylactic therapy to prevent hypotension, ultimately reducing the incidence of related morbidities and mortalities.

2. METHODOLOGY

A randomized controlled trial was conducted at the Department of Anesthesiology, Nishtar Hospital Multan, from April 29th, 2019, to October 28th, 2019. The trial consisted of 120 participants, with 60 individuals allocated to each group. The sample size was determined using a power of test of 80% at a 95% confidence level and $\alpha = 5\%$, with P1 representing the prevalence of hypotension in women receiving the vasopressor group at 88%[11] and P2 representing the prevalence of hypotension in women receiving Gelofusine at 65%[12]. Non-probability consecutive sampling was employed for participant selection.

The study included female patients aged 20 to 40 years who were undergoing Cesarean section between 37 to 42 weeks of gestation based on the last menstrual period (LMP), and were administered spinal anesthesia. Exclusion criteria comprised patients with a known allergy to local anesthetics, documented hypertension in medical records, individuals in shock characterized by extremely low blood pressure and unconsciousness, patients with

co-morbid conditions such as bleeding disorders, injection site infections, confirmed valvular heart diseases by echocardiography, and spinal deformities confirmed through clinical examination and radiological assessments. Normotensive patients with baseline systolic blood pressure less than 140mm Hg or diastolic blood pressure less than 90 mmHg were considered eligible for the study.

A study conducted at Nishtar Hospital, Multan, selected 120 patients meeting inclusion criteria after approval from the local ethical committee. Patients underwent pre-operative assessment, including systemic history and general physical examination, and provided informed consent. Hypotension was defined as blood pressure < 100/60 mm Hg, while obesity was classified using WHO criteria (BMI > 27.5 kg/m^2). Cesarean sections planned before 24 hours were considered elective, while those planned within 24 hours were deemed emergency procedures.

Patients were randomly assigned to either group A (prophylactic fluid preload) or group B (vasopressor) using sealed envelopes. Spinal anesthesia was administered, and hypotension was monitored at regular intervals. Data was analyzed using SPSS version 20, calculating mean, standard deviation, frequencies, and percentages. Chi-square tests were used to compare hypotension frequencies between groups, with stratification for age, type of cesarean section, obesity, and residential status. A p-value of ≤0.05 was considered significant.

3. RESULTS

In this study, the age range of participants spanned from 20 to 40 years, with a mean age of 28.45 ± 5.97 years. Within the groups, the mean ages were 28.38 ± 5.90 years for group A and 28.97 ± 6.01 years for group B. The majority of patients, accounting for 55.83%, fell within the age bracket of 20 to 30 years, as detailed in Table 1. Analysis of BMI revealed a mean of 29.0 ± 3.33 kg/m2 for group A and 29.45 ± 3.50 kg/m2 for group B, as shown in Table VI. Distribution based on residence and type of cesarean section is provided in Table 1. Notably, the frequency of hypotension observed during lumbar spinal anesthesia was 51.67% with prophylactic use of fluid Gelofusine and 70.0% with Synephrine, as outlined in Table 2, with a statistically significant p-value of 0.040.

Table-1: Demographics and type cesarean section

Characteristics	Group A (n=60)	Group B (n=60)
Age	28.38 ± 5.90	28.97 ± 6.01
BMI Kg/m2	29.0 ± 3.33	29.45 ± 3.50
Residence		
Rural	27 (45%)	30 (50%)
Urban	33 (55%)	30 (50%)
Caesarean Type		
Emergency	28 (46.6%)	26 (43.3%)
Elective	32 (53.3%)	34 (56.6%)

Table-2: Comparison of frequency of between groups

Characteristics	Group A	Group B
Hypotension		
Yes	31 (51.6%)	42 (70%)
No	29 (48.3%)	18 (30%)
P Value	0.040	

4. DISCUSSION

Hypotension after spinal anesthesia in partients results from sympathetic blockade causing peripheral vasodilation and blood pooling, reducing venous return and cardiac output. Patients are at higher risk due to the need for a higher block level (T4), pregnancy-related physiological changes, and increased sensitivity to sympathectomy effects. Prevention methods for hypotension are similar for both pregnant and non-pregnant patients[13].

In a comparative study, Chan et al[11] observed a 65% incidence of hypotension

among women undergoing treatment with fluid preload (gelofusine) in group A, where the mean age of patients was 28.38 ± 5.90 years. Contrastingly, Choudhary et al[12] reported a notably higher incidence of hypotension, reaching 88%, among women treated with vasopressors (Synephrine) in group B, where the mean age of patients was 28.97 ± 6.01 years. These findings underscore the differential effects of fluid preload and vasopressors on the occurrence of hypotension, potentially informing clinical decision-making regarding the management of hemodynamic stability in female patients undergoing similar interventions.

In studies comparing pre-loading and co-loading in parturient, results suggest that findings can be extrapolated to the wider population undergoing spinal anesthesia, leading to widespread acceptance of co-loading among clinicians due to inconsistent pre-loading benefits. Recent research, such as that conducted by Ewaldsson et al[14] and Dyer et al[15], demonstrates that rapid administration of crystalloids post-spinal anesthesia initiation sustains increased cardiac output and reduces the incidence of spinal-induced hypotension, supporting the physiological appropriateness of co-loading. This approach aligns with the peak vasodilatation effect of spinal anesthesia, effectively mitigating hypotension by coinciding with the intravascular volume increase.

MacLennan et al[16] discovered that while co-loading appears generally safer, concerns persist regarding reduced oxygen carrying capacity and heightened risk of pulmonary edema among pregnant patients; however, previous investigations by Carvalho et al[17] and Siddik-Sayyid et al[18], comparing pre-loading and co-loading during spinal anesthesia, have yielded inconsistent findings without conclusive evidence favoring either method, with the majority of clinical studies comparing the two through colloid solution administration and finding similar incidences of hypotension and vasopressor requirements between methodologies.

Rout et al[19] study found that rapid administration of crystalloid preload before spinal anesthesia, whether over 20 minutes or 10 minutes at 20 ml/kg, did not reduce the incidence or severity of hypotension. In contrast, Baraka et al[20] research suggested that prophylactic administration of gelatin was more effective than saline in mitigating hypotension induced by spinal anesthesia.

5. CONCLUSION

The prophylactic use of Gelofusine preload during the induction of spinal anesthesia for elective cesarean section demonstrates a lower frequency of hypotension compared to synephrine preload, suggesting its routine utilization in our general practice to prevent spinal-induced hypotension and effectively manage patients undergoing spinal anesthesia.

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