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ORIGINAL ARTICLE

# Prophylactic Intravenous administration of ondansetron for prevention of spinal anesthesia induced hypotension in elderly patients.

**Abida Batool[1], Mohsin Riaz Askri[2], Noor ul Ain Yousafi[3], Bismah Jabeen[4], Waleed Manzoor[5], Shumyala Maqbool[6]**

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**ABSTRACT… Objective:** To evaluate the efficacy of intravenous Ondansetron in reducing the incidence of spinal anesthesia-induced hypotension in elderly patients undergoing elective surgery. **Study Design:** Cross-sectional study. **Setting:** Independent University Hospital Faisalabad. **Period:** February 1, 2024, to July 31, 2024. **Methods:** One hundred elderly patients (aged 50-80 years) undergoing elective surgical procedures under spinal anesthesia, meeting the inclusion and exclusion criteria, were enrolled after obtaining informed consent. Ondansetron (8 mg) was administered intravenously five minutes before spinal anesthesia. Blood pressure was monitored at three-minute intervals for 30 minutes post-procedure to assess the incidence of hypotension, defined as a systolic blood pressure drop exceeding 20% from baseline or below 90 mmHg. Statistical analysis included chi-square tests for associations between demographic variables and hypotension incidence. **Results:** The study found hypotension in 39% of patients despite Ondansetron administration. Stratification by age, gender, and body mass index (BMI) showed no significant associations with hypotension incidence. **Conclusion:** Ondansetron demonstrated partial efficacy in reducing spinal anesthesia-induced hypotension. Future research with control groups and larger cohorts is recommended to confirm these findings and explore optimal preventive strategies.

**Key words:** Hypotension, Ondansetron, Prophylaxis, Spinal Anesthesia.

## INTRODUCTION

Aging is associated with a decline in functional reserve of cardio-respiratory system, increasing the vulnerability of elderly patients undergoing spinal anesthesia. Hypotension is a frequent complication due to autonomic imbalance, and Ondansetron, a selective serotonin 5-hydroxytryptamine receptor type 3 antagonist, may mitigate this condition through multiple mechanisms.

Spinal anesthesia, first introduced by Karl August Bier in 1899, remains a cornerstone in modern anesthetic practice due to its simplicity, efficacy, and safety.[1] It is widely used for lower limb, pelvic, and abdominal surgeries, particularly in elderly patients because it offers advantages such as reduced intraoperative blood loss, fewer transfusion requirements, and a decreased risk of thromboembolism.[2,3] However, spinal anesthesia is not without risks, with hypotension being the most common complication occurring in 15-80% of patients.[4,5]

The primary mechanism of spinal anesthesia-induced hypotension involves sympathetic nervous system blockade, leading to vasodilation and decreased systemic vascular resistance. Additionally, activation of the Bezold-Jarisch reflex, mediated by serotonin-sensitive chemoreceptors, further exacerbates hypotension and bradycardia by stimulating parasympathetic activity.[6] The elderly population is particularly vulnerable due to age-related cardiovascular changes, including reduced baroreceptor sensitivity and increased arterial stiffness.[7]

Ondansetron, a selective serotonin 5-hydroxytryptamine receptor type 3 antagonist, has shown promise in mitigating spinal

1. MBBS, FCPS, Senior Registrar Anesthesia, Allied Hospital/Faisalabad Medical University, Faisalabad.
2. MBBS, FCPS, Assistant Professor Anesthesia, Children Hospital & The Institute of Child Health, Faisalabad.
3. MBBS, FCPS, Senior Registrar Anesthesia, Children Hospital & The Institute of Child Health, Faisalabad.
4. MBBS, Senior Medical Officer Anesthesia, Independent University Hospital, Faisalabad.
5. MBBS, FCPS, Senior Registrar Anesthesia & ICU, Al-Adan Hospital, Kuwait.
6. MBBS, FCPS, Senior Registrar Anesthesia, Allied Hospital/ Faisalabad Medical University, Faisalabad.

**Correspondence Address:**
Dr. Mohsin Riaz Askri
Department of Anesthesia
Children Hospital & The Institute of Child Health, Faisalabad.
mohsinriazaskri@gmail.com

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anesthesia-induced hypotension. By blocking serotonin receptors in the Bezold-Jarisch reflex, Ondansetron may stabilize blood pressure and improve hemodynamic outcomes during spinal anesthesia.[8] This study investigates the prophylactic use of Ondansetron in elderly patients to reduce the frequency of spinal anesthesia-induced hypotension and examines its association with demographic and clinical variables.

## METHODS

The cross-sectional study was conducted in the Independent University Hospital Faisalabad from February 1, 2024, to July 31, 2024. The study adhered to ethical standards and received approval from the institutional ethical committee (000057).

### Sample Size

Sample size estimation was conducted using WHO-recommended procedures for determining sample sizes in health research.[9] Using a prevalence (P) of 46%, a 95% confidence level, and an absolute precision (d) of 10%, the required sample size was approximately 100 patients.

Patients aged 50–80 years undergoing elective surgeries were included based on predefined inclusion and exclusion criteria, and a non-probability consecutive sampling technique was employed to select the study participants.

### Inclusion Criteria

1. Patients classified as American Society of Anesthesiologists (ASA) Grade I-II.
2. Both genders.

### Exclusion Criteria

1. History of ischemic heart disease.
2. Renal disease or impaired renal function.
3. Hypersensitivity to study drugs.
4. Failed spinal block or contraindications to spinal anesthesia.
5. Morbid obesity, defined as body mass index exceeding 35 kilograms per square meter.

After obtaining informed consent, patients were prepared with standard monitoring, including electrocardiogram, pulse oximetry, and non-invasive blood pressure measurement. An 18-gauge intravenous cannula was inserted, and Ringer's lactate solution (10 ml per Kg of body weight) was administered as preloading fluid therapy. Ondansetron (8 mg diluted in 5 ml of normal saline) was administered intravenously five minutes before the spinal block.

Spinal anesthesia was performed using a 25-gauge Quincke needle at the L3-4 interspace in a sitting position. A single dose of 15 mg of hyperbaric bupivacaine (0.75%) was injected intrathecally. Patients were immediately placed in the supine position post-procedure, and blood pressure was measured every three minutes for 30 minutes. The data was recorded on a pre-designed proforma.

Data were analyzed using SPSS version 23. Continuous variables such as age and body mass index (BMI) were expressed as mean ± standard deviation. Categorical variables, including gender and incidence of hypotension, were presented as frequencies and percentages. Associations between demographic variables and hypotension were assessed using chi-square tests, with $p<0.05$ considered statistically significant.

### Definition of Hypotension

Hypotension is a systolic blood pressure drop exceeding 20% from the patient's baseline or a systolic blood pressure below 90 mmHg. Rescue measures, including administration of ephedrine, were recorded as required.

## RESULTS

The study enrolled 100 patients, 77% aged 50-65 and 23% aged 66-80. The mean age was 60.38 ± 5.51 years (Table-I).

| Age (in Years) | No. of Patients (%) |
|---|---|
| 50–65 | 77 (77%) |
| 66–80 | 23 (23%) |
| Total | 100 (100%) |

**Table-I. Age distribution of patients**

Mean ± SD: 60.38 ± 5.51

Gender distribution showed 44% male and 56%

female patients (Figure-1).

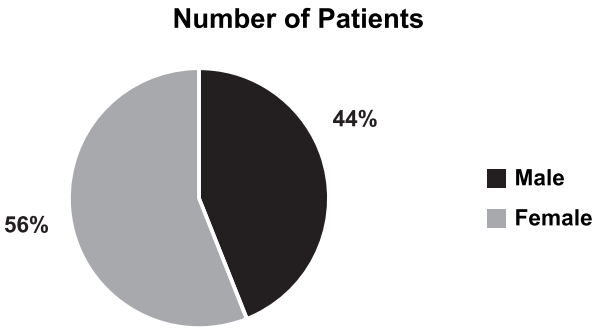


**Figure-1. Gender distribution Body Mass Index (BMI)**

57% patients had BMI < 30, and 43% had BMI > 30. The mean body mass index was 29.97 ± 2.62 kilograms per square meter.

Among older adults undergoing elective surgery under spinal anesthesia, 39% (n=39) experienced hypotension despite receiving Ondansetron prophylaxis, while 61% (n=61) remained normotensive (Figure-2).

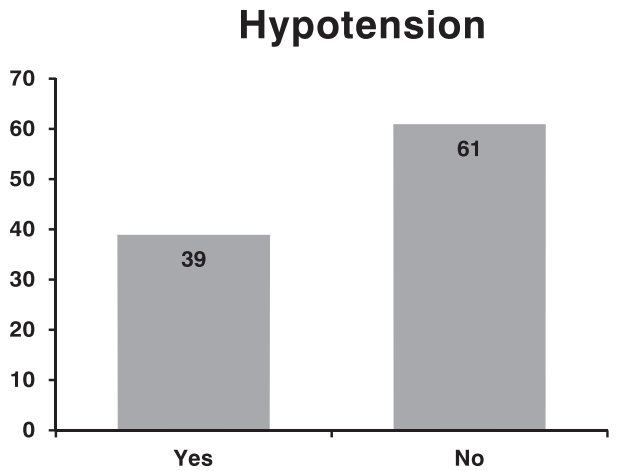


**Figure-2. Frequency of hypotension in patients administered with ondansetron (n=100)**

Stratification by age groups (50-65 years versus 66-80 years) revealed no significant difference (p=0.98) (Table-II).

Similarly, no significant associations were found between hypotension and gender (p=0.57) revealed by 39% of the hypotension cases (Table-III).

Stratification by BMI showed p-value of 0.85, indicating no significant correlation between BMI and the incidence of hypotension (Table-IV).

| Age (in Years) | Total No of patients | Hypotension (Yes) | Hypotension (No) | P-Value |
|---|---|---|---|---|
| 50-65 | 77 | 30 (38.9%) | 47 (61.1%) | 0.98 |
| 66-80 | 23 | 9 (39.1%) | 14 (60.9%) | |

**Table-II. Stratification of hypotension by age (n=100)**

| Gender | Total No of Patients | Hypotension (Yes) | Hypotension (No) | P-Value |
|---|---|---|---|---|
| Male | 44 | 19 (43.2%) | 25 (56.8%) | 0.57 |
| Female | 56 | 20 (35.7%) | 36 (64.3%) | |

**Table-III. Stratification of hypotension by gender (n=100)**

| BMI | Total No of Patients | Hypotension (Yes) | Hypotension (No) | P-Value |
|---|---|---|---|---|
| < 30 | 57 | 20 (35.1%) | 37 (64.9%) | 0.85 |
| >30 | 43 | 19 (44.2%) | 24 (55.8%) | |

**Table-IV. Stratification of hypotension by BMI (n=100)**

Most hypotensive episodes were observed within the first 15 minutes post-anesthesia. Rescue management with intravenous ephedrine was required in 20% of these hypotensive cases. Notably, higher baseline blood pressure did not appear to reduce the overall incidence of hypotension.

## DISCUSSION

The findings provide insights into the incidence of hypotension following spinal anesthesia in elderly patients and the prophylactic role of Ondansetron. Despite its administration, 39% of patients aged 50–80 years experienced hypotension, whereas 61% remained normotensive. This incidence is lower than the 46% reported by Shah et al. for older adults administered Ondansetron[10], yet mirrors the 39.3% hypotension rate observed by Ragu et al. in their ondansetron group compared to 60.7% in placebo-treated individuals.[11] Notably,

no significant associations emerged between hypotension and age, gender, or BMI within this cohort, suggesting these variables may not be key predictors of hypotension risk when Ondansetron is used prophylactically.

However, the persistence of hypotension in a substantial portion of patients underscores the need for a multimodal strategy to manage spinal anesthesia in the elderly population. While Ondansetron partially reduces hypotension rates, its selective blockade of 5-HT3 receptors does not entirely overcome the impacts of sympathetic blockade or pre-existing autonomic dysfunction in older adults. Other studies support these observations; for instance, Owczuk et al. and a subsequent meta-analysis by Tubog et al. concluded that Ondansetron decreases[12,13] but does not eliminate the risk of spinal anesthesia-induced hypotension. Consequently, a comprehensive approach incorporating careful patient selection, optimized fluid management, and prompt use of vasopressors appears indispensable.

Nonetheless, these findings collectively highlight the partial but significant impact of Ondansetron and the continued importance of adjunctive measures in improving hemodynamic stability among elderly individuals undergoing spinal anesthesia.

The results support the integration of Ondansetron into routine anesthetic management for elderly patients undergoing spinal anesthesia. However, its use should be complemented by additional preventive measures tailored to individual patient profiles.

## LIMITATIONS

The study's single-center design may limit its findings' generalizability, as the results might not be representative of broader or diverse populations. Additionally, the absence of a control group restricts the ability to draw definitive conclusions about the efficacy of Ondansetron, as comparisons to placebo or alternative treatment are essential for robust evaluations. Furthermore, the sample size was insufficient to assess potential interactions between multiple demographic and clinical variables, which could provide deeper insights into the factors influencing the outcomes.

## CONCLUSION

Ondansetron demonstrates partial efficacy in reducing spinal anesthesia-induced hypotension in elderly patients. While it represents a valuable component of a broader preventive strategy, further research is necessary to confirm its effectiveness in diverse populations and explore optimal dosing regimens. Future studies should include more significant multicenter trials with control groups and investigate combination strategies involving Ondansetron and other preventive measures.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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| AUTHORSHIP AND CONTRIBUTION DECLARATION | |
|---|---|
| 1 | **Abida Batool:** Manuscript writing. |
| 2 | **Mohsin Riaz Askri:** Literature search, study design concept. |
| 3 | **Noor ul Ain Yousafi:** Data analysis. |
| 4 | **Bismah Jabeen:** Data interpretation. |
| 5 | **Waleed Manzoor:** Statistical analysis, proof reading. |
| 6 | **Shumyala Maqbool:** End note, references, proof reading. |