

Research Article

Comparative Effects of Glycine 1.5% versus Dextrose 5% Irrigation on Postoperative Cognitive Function in Patients Undergoing Transurethral Resection of Prostate (TURP)

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Abstract: Objective: To compare the effects of Glycine 1.5% and Dextrose 5% irrigation fluids on postoperative cognitive function in patients undergoing transurethral resection of the prostate (TURP) under spinal anesthesia. **Methodology:** This prospective observational study was undertaken at tertiary care centres of Pakistan. A total of 120 male patients aged 40–80 years who had TURP under spinal anesthesia were included and divided into two groups based on irrigation fluid used: Glycine 1.5% and Dextrose 5% (60 in each). Cognitive function was assessed using the Montreal Cognitive Assessment (MoCA) preoperatively and one hour postoperatively. Blood glucose levels, perioperative complications, and patient satisfaction were recorded. Data were analysed using SPSS 27. $P \leq 0.05$ was considered significant. **Results:** Baseline characteristics and preoperative cognitive scores were comparable between groups ($p > 0.05$). Postoperative cognition scores dropped significantly in both groups ($p < 0.001$); however, the decline was greater in the Dextrose group (24.20 ± 2.75) compared to the Glycine group (26.33 ± 1.81 , $p < 0.001$). Postoperative blood glucose levels were significantly higher in the Dextrose group (144.52 ± 12.18 mg/dL) compared to the Glycine group (105.55 ± 13.74 mg/dL, $p < 0.001$). Perioperative complications were more frequent in the Glycine group ($p < 0.05$). However, patient satisfaction was comparable ($p = 0.207$). **Conclusion:** Both irrigation fluids were associated with early postoperative cognitive decline; however, it was greater in dextrose group. Intraoperative hemodynamic changes were seen in glycine group while nausea and its combination with other complications was associated with dextrose. Patient satisfaction remained comparable in both groups.

Keywords: BPH, TURP, Cognitive impairment (POCD), Glycine, and Dextrose.

INTRODUCTION

Benign prostatic hyperplasia (BPH) is a common condition among elderly males(1). It is characterized by non-malignant enlargement of the prostate gland leading to lower urinary tract symptoms(2). To treat these symptoms, surgical management remains necessary in moderate to severe cases.

Despite technological advancements, Transurethral Resection of the Prostate (TURP) remains the gold standard surgical procedure in which monopolar TURP is common particularly in resource-limited settings such as Pakistan(3, 4). During monopolar TURP, non-electrolyte irrigation fluids such as Glycine 1.5% and Dextrose 5% are commonly used which are associated with systemic absorption. Irrigation fluid is absorbed at a rate of 10-30 ml per minute through prostatic sinuses, that is almost 1-2 litres of the total fluid used during TURP(5, 6). Glycine, being hypotonic (190 mosmol/kg), gets absorbed rapidly, may cause dilutional hyponatremia and hyperammonemia leading to TURP syndrome and associated neurological symptoms such as drowsiness, confusion, blurred vision, nausea and uneasiness. Dextrose being iso-osmotic (285 mosmol/kg) is relatively safe but may result in perioperative hyperglycemia(7, 8). However, previous studies found that an acute increase in blood glucose level during surgery due to surgical stress is linked to immediate short-term postoperative cognitive impairment(9). Postoperative cognitive dysfunction (POCD) is a condition that frequently arises after surgical procedures particularly among elderly patients most commonly after 65 years. It is the decline in memory, attention, thinking, language, emotions and other cognitive abilities postoperatively which negatively affects recovery and quality of life(10). Generally, almost 12% of the asymptomatic patients are expected to develop POCD after noncardiac surgeries. Although usually transient, POCD has been linked to an elevated long-term risk of developing Alzheimer's disease(11, 12). Although prior studies have compared metabolic and electrolyte disturbances associated with irrigation fluids, limited data are available comparing the direct impact of Glycine versus Dextrose irrigation on postoperative cognitive function. This study aimed to compare their effects on early postoperative cognitive outcomes.

MATERIALS AND METHODS

This prospective observational comparative study was conducted at Pakistan Institute of Medical Sciences (PIMS), Capital Hospital Islamabad, and Al-Sadiq Surgical Hospital, Kamalia, from November 2025 to March 2026. A total of 120 individuals aged 40-80 years diagnosed with benign prostatic hyperplasia undergoing TURP under spinal anesthesia were included. Patients were divided into two groups based on the irrigation fluid used during the procedure:

Group A: Glycine 1.5% (n=60)

Group B: Dextrose 5% (n=60)

The sample size was calculated using a 95% confidence level, 5% margin of error, and an estimated prevalence of 7.8%(13), providing a minimum required sample size of 110.4, which was increased to improve the reliability of results.

Participants were selected using a non-probability convenient sampling technique.

Ethical approval was obtained from the Institutional Review Board of Bashir Institute of Health Sciences, Islamabad. Administrative permissions were obtained from PIMS and Capital Hospital, Islamabad and Al-Sadiq Surgical Hospital, Kamalia. Informed consent was obtained from all included participants.

Inclusion Criteria

- Patients aged 40–80 years
- ASA physical status I–III
- Diagnosed cases of BPH undergoing elective TURP
- Procedures performed under spinal anesthesia
- Patients who were able to participate in neurocognitive test pre and postoperatively.

Exclusion Criteria

- ASA class IV and V patients
- Emergency surgical cases
- Patients undergoing TURP with irrigation fluids other than glycine or dextrose
- History of metabolic, severe cardiovascular, or neurological disorders
- History of alcohol use or drug abuse.

Data were collected using a proforma. Cognitive function was assessed using the Montreal Cognitive Assessment (MoCA), a standard tool for detecting POCD(14). Assessment was performed at two time points. Preoperatively to establish baseline cognitive status and 1 hour postoperatively. Patient satisfaction was evaluated after surgery using a Likert scale and were classified as satisfied or dissatisfied based on demarcation threshold formula(15).

The primary outcome was postoperative cognitive dysfunction (POCD), assessed by changes in MoCA scores. Secondary outcomes included patient satisfaction, perioperative complications and blood glucose levels.

Data were analyzed using SPSS version 27.0. Continuous variables were expressed as mean $\pm$ standard deviation and compared using independent-sample t-test and paired t-test as per requirement. Categorical variables were presented as frequencies and percentages and examined using the chi-square or Fisher's exact test. A p-value of 0.05 or less was considered statistically significant.

RESULTS

A total of 120 male patients who underwent TURP were included and equally divided into glycine and dextrose groups. Baseline demographic characteristics such as age and educational status, were comparable between groups. The majority of patients in both groups belonged to the age group of 61–70 years (48.3%). The mean age was 64.9 ± 8.7 years in glycine group and 66.6 ± 6.6 years in the dextrose group which did not differ significantly between groups ($p = 0.097$). The difference in educational status of patients, which could affect cognitive function, was also insignificant ($p = 0.237$) (Table-I).

Table-I: Patient Demographics

Demographics		Irrigation Fluid		Total	p value
		Glycine (%)	Dextrose (%)		
Age	41-50 years	05 (8.3)	00 (0.0)	05 (4.2)	0.097
	51-60 years	12 (20)	10 (16.7)	22 (18.3)	
	61-70 years	25 (41.7)	33 (55.0)	58 (48.3)	
	71-80 years	18 (30)	17 (28.3)	35 (29.2)	
Education	Illiterate	08 (13.3)	07 (11.7)	15 (12.5)	0.237
	Primary	09 (15.0)	09 (15.0)	18 (15.0)	
	Middle	16 (26.7)	10 (16.7)	26 (21.7)	
	Secondary	07 (11.7)	18 (30.0)	25 (20.8)	
	Intermediate	18 (30.0)	14 (23.3)	32 (26.7)	
	Graduation	02 (3.3)	02 (3.3)	04 (3.3)	
Total		60 (100)	60 (100)	120 (100)	

The duration of surgery was significantly longer in the glycine group (80.70 ± 20.72 minutes) compared to the dextrose group (50.83 ± 15.22 minutes) ($p < 0.001$). Despite difference in surgery duration, the volume of irrigation fluid used was comparable ($p = 0.411$) (Table II).

Table-II: Volume of Irrigation Fluid used

Fluid Volume used (L)	Glycine (%)	Dextrose (%)	Total (%)	p value
9-12L	17 (14.7)	11 (9.2)	28 (23.9)	0.411
13-16L	37 (30.8)	41 (34.2)	78 (65.0)	
17_20L	06 (5.0)	08 (6.7)	14 (11.7)	
Total	60 (50)	60 (50)	120 (100)	

Preoperative cognitive scores were similar between groups ($p = 0.343$). Postoperative decline in cognitive function was observed significantly in both groups compared to baseline ($p < 0.001$) with a significantly greater reduction in the dextrose group ($p < 0.001$). Baseline random blood sugar levels were comparable ($p = 0.172$). Postoperatively, a significant rise in blood glucose levels was observed in both groups ($p < 0.001$), with a markedly higher increase in the dextrose group ($p < 0.001$) (Table III).

Table-III: Comparison of Clinical Outcomes between Glycine & Dextrose Groups

Outcome	Glycine (n=60)	Dextrose (n=60)	p-value
Pre-op Blood Glucose	89.82 ± 9.57	91.68 ± 4.38	0.172
Post-op Blood Glucose	105.55 ± 13.74	144.52 ± 12.18	<0.001
Pre-op Cognitive Score	27.30 ± 1.59	27.02 ± 1.67	0.343
Post-op Cognitive Score	26.33 ± 1.81	24.20 ± 2.75	<0.001
Patient Satisfaction (%)	98.3%	91.7%	0.207

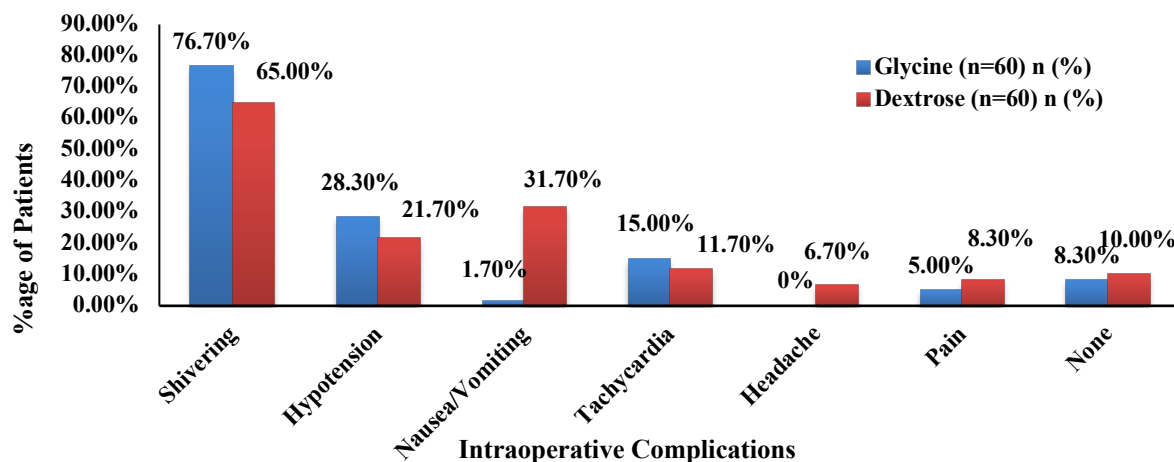


Figure-1: Association between Irrigation Fluid & Intraoperative Complications.

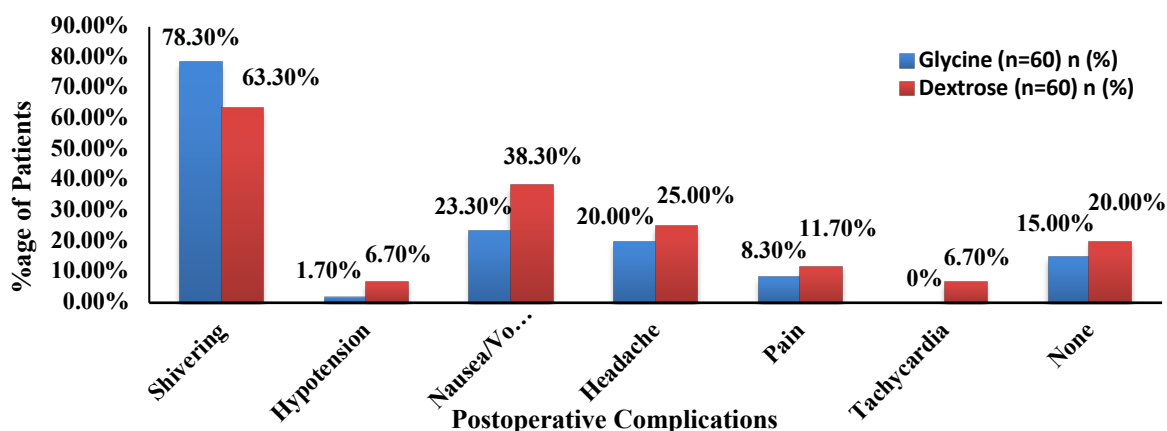


Figure-2: Association between Irrigation fluid and Postoperative Complications

Perioperative complications differed significantly between groups ($p < 0.05$). Shivering was the most common complication in both groups but was slightly more frequent in the glycine group. The glycine group also demonstrated a higher frequency of hypotension during the surgery, whereas nausea and vomiting were more commonly observed in the dextrose group during and after the surgery (Figure 1 & 2). Despite significant differences, postoperative patient satisfaction was high in both groups, with no statistically significant difference observed between glycine and dextrose groups ($p = 0.207$) as presented in Table-III.

DISCUSSION

The study demonstrates that although cognitive decline occurred in both groups, it was significantly greater in patients receiving dextrose irrigation. Majority of the patients of both groups belonged to the 61–70 and 71–80 years age groups ($p = 0.097$), as reported in previous epidemiological study that highest incidence of BPH occurs in patients of 60–79 years age group(16). The patients had comparable educational status ($p = 0.237$). The baseline variables were also comparable in both groups such as patient blood sugar levels and preoperative cognitive scores indicating that two groups were well matched which support the validity of postoperative comparisons.

Most surgeries in dextrose group were completed within 30–60 minutes with the mean duration of 50.83 ± 15.22 while patients in glycine group had slightly prolonged surgeries completed mostly within 90 minutes with the mean time of 80.70 ± 20.72 , which was consistent with previous studies showing similar mean surgery times of 42.5 ± 20.04 minutes, 45 to 90 minutes, and 63.8 minutes in glycine and 65.42 minutes in dextrose(7, 17, 18). In contrast to prior studies, in this study few procedures in glycine group exceeded 90 minutes. In majority of patients, 13–16 litres of irrigation fluid was used in both groups which was comparable between two groups ($p = 0.411$). The lack of significant differences in these variables showed, the changes in outcomes were more likely related to the type of irrigation fluid used.

The difference in the intraoperative complications and postoperative complications between glycine and dextrose groups was significant ($p < 0.05$). Shivering was the most common complication in both groups during perioperative period, particularly in patients receiving glycine irrigation. Shivering had been reported to be associated with spinal anesthesia or could have resulted from excessive fluid absorption or hypothermia due to evaporation from exposed surgical site(5, 19). However, slightly higher frequency of complications was observed in glycine group as compared to dextrose group in which hypotension was frequently observed in the glycine group during intraoperative period these findings were consistent with previous studies, which reported that fluid absorption was higher during glycine irrigation (2.5 ± 0.7 L) due to its hypotonic nature which resulted frequent complications such as TURP syndrome leading to hemodynamic changings as compared to dextrose irrigation (1.9 ± 0.5 L)(7, 20). In contrast, nausea and its combination with other complications was frequently reported in dextrose group.

Preoperative random blood glucose levels were comparable between the two groups ($p = 0.172$). However, in postoperative period a significant rise in blood glucose levels was observed in the dextrose group relative to the glycine group ($p < 0.001$). This finding aligned with previous literature demonstrating that excessive fluid absorption during dextrose irrigation resulted in transient hyperglycemia(7, 21)

The primary outcome of this study was postoperative cognitive function. Patients cognitive function was assessed using MoCA score because of its high sensitivity and better discriminative power to detect even mild cognitive impairment as compared to MMSE score(22, 23). The study found that cognitive function was declined significantly in both groups ($p < 0.001$) from the comparable baseline cognitive scores ($p = 0.343$). This finding was contrasting to previous study which assessed patients cognitive function using MMSE score after TURP using glycine irrigation(24). Although decline was observed in both groups following surgery, the magnitude of decline was significantly greater in the dextrose group i.e., from baseline cognitive scores of 27.02 ± 1.67 to postoperative scores of 24.20 ± 2.75 ($p < 0.001$). Patients receiving glycine irrigation were found to have a smaller reduction in MoCA scores from baseline 27.30 ± 1.59 to postoperative 26.33 ± 1.81 ($p < 0.001$), indicating better preservation of cognitive function. These results were particularly notable in view of recent finding associating perioperative hyperglycemia to acute cognitive impairment(9). Despite differences in complications and cognitive outcomes, patient satisfaction did not differ considerably between the glycine and dextrose groups (p

$= 0.207$). The majority of patients in both groups were satisfied after the surgery.

Limitations: Cognitive function was examined only in the early postoperative period and patient long-term cognitive function could not be assessed. The sample size was relatively small which may restrict generalizability of the study findings. Furthermore, biochemical profiles such as serum ammonia, and inflammatory biomarkers were not investigated.

CONCLUSION

Both glycine and dextrose irrigation are associated with postoperative cognitive decline after TURP; however, the decline is greater with dextrose. Glycine is linked with more hemodynamic disturbances, while dextrose is associated with nausea and transient hyperglycemia. Patient satisfaction remained comparable. Glycine may be preferred when preservation of cognitive function is a priority.

Conflict of interest: None

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