

**ORIGINAL ARTICLE****Assessment of risk factors of postoperative delirium after orthopedic surgery**

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**ABSTRACT:**

**Background:** Postoperative delirium is a common and often distressing complication that can occur after surgery, particularly in elderly patients or those with pre-existing cognitive impairment. The present study was conducted to assess risk factors of postoperative delirium after orthopedic surgery. **Materials & Methods:** 70 patients who underwent orthopaedic surgery of both genders were divided into 2 groups of 35 each. Group I was those who had delirium and group II did not have delirium. Parameters such as hospitalization, type of surgery, albumin, hemoglobin, preoperative creatinine, urea nitrogen, alanine aminotransferase, total bilirubin, intensive care unit (ICU) care, creatinine, urea nitrogen, alanine aminotransferase, total bilirubin, postoperative electrolyte disorders (potassium, sodium, chlorine, and calcium), fasting time, and fluid infusion per hour during fasting was recorded. **Results:** In group I and group II, mean albumin (g/L) pre-operative was 37.2 and 37.1 and post-operative was 36.3 and 36.1. The mean hemoglobin (g/L) preoperative was 115.8 and 116.9 and post-operative was 114.2 and 115.2. The mean creatinine ( $\mu\text{mol/L}$ ) pre-operative was 75.8 and 69.4 and post-operative was 76.8 and 66.2. The mean urea nitrogen (mmol/L) pre-operative was 6.8 and 7.2 and post-operative was 8.4 and 7.1. The mean alanine aminotransferase (U/L) pre-operative was 13.7 and 16.4 and post-operative was 15.4 and 15.9. The mean total bilirubin ( $\mu\text{mol/L}$ ) pre-operative was 15.7 and 16.2 and post-operative was 17.8 and 18.4 respectively. Postoperative delirium was seen in 30 patients. Type of surgery performed was FHR in 7, IFIF in 16 and THA in 12 patients. There were 13 males and 22 females. Electrolyte disorders were seen in 28. The post-operative creatinine ( $\mu\text{mol/L}$ ) found to be 68.5, post-operative fasting time (h) was 19.3 and fluid infusion per hour during fasting (mL/h) was 120.5. The difference was significant ( $P < 0.05$ ). **Conclusion:** Three primary risk factors for postoperative delirium following orthopedic surgery were reduced fluid infusion per hour during fasting, elevated postoperative creatinine, and postoperative electrolyte abnormalities. Reducing the length of fasting and increasing perioperative rehydration could lower the risk of surgical delirium.

**Keywords:** Delirium, Electrolyte, orthopedic

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**INTRODUCTION**

Delirium is an acute and fluctuating disturbance in attention, awareness, and cognition. It often manifests as confusion, disorientation, and changes in perception.<sup>1</sup> Postoperative delirium is a common and often distressing complication that can occur after surgery, particularly in elderly patients or those with pre-existing cognitive impairment. Several factors can increase the risk of postoperative delirium, including advanced age, pre-existing cognitive impairment (such as dementia), certain medical conditions (e.g., Parkinson's disease), use of certain medications (e.g., sedatives, opioids), prolonged surgery, and underlying psychiatric disorders.<sup>2</sup>

The exact mechanisms underlying postoperative delirium are not fully understood but are believed to involve a combination of factors, including inflammation, neurotransmitter imbalances, oxidative stress, and alterations in cerebral blood flow.<sup>3</sup> Surgical stress, anesthesia, and perioperative medications may contribute to these processes. Postoperative delirium typically presents with symptoms such as confusion, disorientation, agitation, hallucinations, and fluctuating levels of consciousness. Symptoms may

worsen at night (referred to as "sundowning") and can vary in severity throughout the day.<sup>4</sup>

Following hip replacement, fracture fixation, knee replacement, lumbar decompression, and lumbar fusion surgical operations, among other treatments, postoperative delirium is frequently observed in orthopedic wards.<sup>5</sup> In general, postoperative delirium is detrimental to rehabilitation; additionally, it raises medical expenses and postpones patients' release from the hospital. In addition, delirium may result in other dangerous side effects such as bedsores, fractures from falls, and even death.<sup>6</sup> The present study was conducted to assess risk factors of postoperative delirium after orthopedic surgery.

**MATERIALS & METHODS**

The present study was conducted on 70 patients who underwent orthopaedic surgery of both genders. All were informed regarding the study and their written consent was obtained. Delirium was diagnosed based on the Diagnostic and Statistical Manual of Mental Disorders, 4th edition, Text Revision.

Data such as name, age, gender etc. was recorded. Patients were divided into 2 groups of 35 each. Group

I was those who had delirium and group II did not have delirium. Parameters such as hospitalization, type of surgery, albumin, hemoglobin, preoperative creatinine, urea nitrogen, alanine aminotransferase, total bilirubin, e intensive care unit (ICU) care, creatinine, urea nitrogen, alanine aminotransferase, total bilirubin, postoperative electrolyte disorders (potassium, sodium, chlorine, and calcium), fasting

time, and fluid infusion per hour during fasting. The serum concentrations of creatinine, urea nitrogen, alanine aminotransferase, and total bilirubin were determined preoperatively and 1 day postoperatively. Potassium, sodium, calcium, and chlorine were measured 1 day postoperatively. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

**RESULTS**

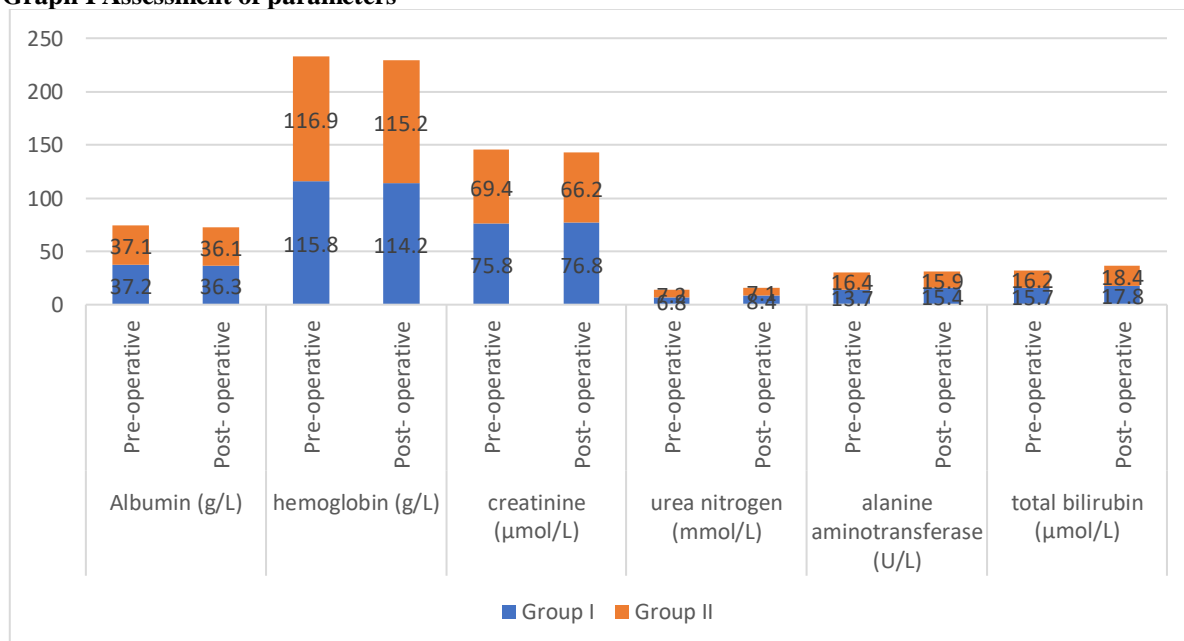
**Table I Assessment of parameters**

Parameters	Variables	Group I	Group II	P value
Albumin (g/L)	Pre-operative	37.2	37.1	0.17
	Post-operative	36.3	36.1	0.42
hemoglobin (g/L)	Pre-operative	115.8	116.9	0.84
	Post-operative	114.2	115.2	0.93
creatinine (µmol/L)	Pre-operative	75.8	69.4	0.02
	Post-operative	76.8	66.2	0.01
urea nitrogen (mmol/L)	Pre-operative	6.8	7.2	0.05
	Post-operative	8.4	7.1	0.04
alanine aminotransferase (U/L)	Pre-operative	13.7	16.4	0.01
	Post-operative	15.4	15.9	0.19
total bilirubin (µmol/L)	Pre-operative	15.7	16.2	0.32
	Post-operative	17.8	18.4	0.57

Table I, graph I shows that in group I and group II, mean albumin (g/L) pre-operative was 37.2 and 37.1 and post-operative was 36.3 and 36.1. The mean hemoglobin (g/L) preoperative was 115.8 and 116.9 and post-operative was 114.2 and 115.2. The mean creatinine (µmol/L) pre-operative was 75.8 and 69.4 and post-operative was 76.8 and 66.2. The mean urea

nitrogen (mmol/L) pre-operative was 6.8 and 7.2 and post-operative was 8.4 and 7.1. The mean alanine aminotransferase (U/L) pre-operative was 13.7 and 16.4 and post-operative was 15.4 and 15.9. The mean total bilirubin (µmol/L) pre-operative was 15.7 and 16.2 and post-operative was 17.8 and 18.4 respectively. The difference was significant (P< 0.05).

**Graph I Assessment of parameters**



**Table II Postoperative delirium incidence in group I**

Parameters	Variables	Number	P value
Postoperative delirium	Yes	30	0.01
	No	5	

Type of surgery	FHR	7	0.04
	IFIF	16	
	THA	12	
Gender	Male	13	0.04
	Female	22	
electrolyte disorders	Yes	28	0.01
	No	7	
creatinine ( $\mu\text{mol/L}$ )		68.5	-
Fasting time (h)		19.3	-
Fluid infusion per hour during fasting (mL/h)		120.5	-

Table II shows that postoperative delirium was seen in 30 patients. Type of surgery performed was FHR in 7, IFIF in 16 and THA in 12 patients. There were 13 males and 22 females. Electrolyte disorders was seen in 28. The post-operative creatinine ( $\mu\text{mol/L}$ ) found to be 68.5, post-operative fasting time (h) was 19.3 and fluid infusion per hour during fasting (mL/h) was 120.5. The difference was significant ( $P < 0.05$ ).

## DISCUSSION

Postoperative delirium is associated with an increased risk of adverse outcomes, including longer hospital stays, higher rates of complications (such as infections and pressure ulcers), functional decline, and higher mortality rates.<sup>7,8</sup> Strategies to prevent postoperative delirium include preoperative optimization of medical conditions, minimizing the use of medications that can contribute to delirium, optimizing pain management, maintaining normal sleep-wake cycles, early mobilization, and providing cognitive stimulation.<sup>9,10</sup> The present study was conducted to assess risk factors of postoperative delirium after orthopedic surgery.

We found that in group I and group II, mean albumin (g/L) pre-operative was 37.2 and 37.1 and post-operative was 36.3 and 36.1. The mean hemoglobin (g/L) preoperative was 115.8 and 116.9 and post-operative was 114.2 and 115.2. The mean creatinine ( $\mu\text{mol/L}$ ) pre-operative was 75.8 and 69.4 and post-operative was 76.8 and 66.2. The mean urea nitrogen (mmol/L) pre-operative was 6.8 and 7.2 and post-operative was 8.4 and 7.1. The mean alanine aminotransferase (U/L) pre-operative was 13.7 and 16.4 and post-operative was 15.4 and 15.9. The mean total bilirubin ( $\mu\text{mol/L}$ ) pre-operative was 15.7 and 16.2 and post-operative was 17.8 and 18.4 respectively. Wang et al<sup>11</sup> studied 456 cases that underwent one of three types of orthopedic surgery were included and were defined as the retrospective group. The risk factors of postoperative delirium were analyzed. Compared with patients with normal postoperative electrolytes, postoperative creatinine  $< 68.20 \mu\text{mol/L}$ , and fluid infusion during fasting  $> 119.66 \text{ mL/h}$ , postoperative electrolyte disorders (odds ratio [OR]: 2.864; 95% confidence interval [CI]: 1.374, 5.970), postoperative creatinine  $\geq 68.20 \mu\text{mol/L}$  (OR: 2.660; 95% CI: 1.328, 5.328), and fluid infusion during fasting  $\leq 119.66 \text{ mL/h}$  (OR: 2.372; 95% CI: 1.197, 4.704) were the risk factors for postoperative delirium. After positive intervention, the postoperative delirium incidence of the prospective group was 5.8% (5/86), and it was lower than 18.4% (84/456) of the retrospective group ( $P < 0.05$ ).

We observed that postoperative delirium was seen in 30 patients. Type of surgery performed was FHR in 7, IFIF in 16 and THA in 12 patients. There were 13 males and 22 females. Electrolyte disorders was seen in 28. The post-operative creatinine ( $\mu\text{mol/L}$ ) found to be 68.5, post-operative fasting time (h) was 19.3 and fluid infusion per hour during fasting (mL/h) was 120.5. Chung et al<sup>12</sup> evaluated the incidence and perioperative risk factors of postoperative delirium after TKA. 287 patients (365 knees) aged  $> 65$  years who had undergone primary TKA were enrolled. These patients were assigned to the delirium group of 11 patients (11 knees) or the non-delirium group of 276 patients (354 knees). The incidence of delirium among the patients was 3.1% (11/365). Univariate logistic regression analysis indicated that a history of dementia, older age, lower body mass index (BMI) level, and a postoperative day 3 blood urea nitrogen (BUN) level of  $> 14.9 \text{ mg/dL}$  were risk factors. However, multivariate logistic regression analysis indicated that a history of dementia (adjusted odds ratio [AOR]: 10.4, [1.09, 100]), older age (AOR: 1.15, [1.01, 1.31]), and a postoperative day 3 BUN level of  $> 14.9 \text{ mg/dL}$  (AOR: 4.76, [1.15, 19.7]) were independent risk factors.

The shortcoming of the study is small sample size.

## CONCLUSION

Authors found that three primary risk factors for postoperative delirium following orthopedic surgery were reduced fluid infusion per hour during fasting, elevated postoperative creatinine, and postoperative electrolyte abnormalities. Reducing the length of fasting and increasing perioperative rehydration could lower the risk of surgical delirium.

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