

Factors Associated with Preoperative Anxiety, Postoperative Pain, and Delirium in Maxillofacial Trauma Patients after General Anesthesia

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ABSTRACT

Background: Exposure to general anesthesia is associated with various adverse outcomes for patients, which necessitates careful investigation. Accordingly, this study was conducted with the aim of evaluating factors associated with preoperative anxiety, postoperative pain, and delirium in maxillofacial trauma patients after general anesthesia.

Methods: In this, 91 patients undergoing surgery for maxillofacial trauma were evaluated. The data collection instruments included a demographic characteristics form, the Amsterdam Preoperative Anxiety and Information Scale (APAIS), the CAM-ICU-7 questionnaire, and the Visual Analog Scale (VAS) for pain. After explaining the study objectives to the patients or their legal guardians and obtaining their consent, the APAIS was completed preoperatively, while the CAM-ICU-7 and VAS were administered postoperatively. The collected data were entered into SPSS software version 19, and statistical analyses were performed using an independent t-test, ANOVA, and regression analysis.

Results: The results showed a strong positive correlation between preoperative anxiety and postoperative pain ($r = 0.62$, $P < 0.001$), indicating that higher anxiety is associated with greater pain after surgery. Anxiety also demonstrated a mild but significant correlation with information need ($r = 0.22$, $P < 0.03$). Information need showed a small but significant association with postoperative delirium ($r = 0.27$, $P = 0.008$). No significant relationship was observed between anxiety and delirium ($P = 0.75$). Additionally, postoperative pain showed a mild but significant correlation with delirium ($r = 0.25$, $P < 0.014$).

Conclusion: The findings of this study indicate that preoperative anxiety and postoperative pain are common among maxillofacial trauma patients, and a considerable proportion of these patients experience some degree of postoperative delirium. Improved postoperative pain management and provision of adequate preoperative information may help reduce the severity of delirium and improve postoperative outcomes in this patient population.

The authors declare no conflicts of interest.

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Introduction

Technological advancements and the increasing use of motor vehicles, along with other unforeseen incidents, have exposed humans to various forms of trauma. Trauma refers to any injury, blow, wound, shock, or damage inflicted on the human body by an external force, where the cause of injury is not related to internal factors or disease processes [1-2]. Recently, there has been a marked increase in maxillofacial injuries. Head and neck trauma and its associated injuries account for a high rate of mortality and neurological deficits. Facial trauma may be accompanied by intracranial, pulmonary, intra-abdominal, or limb injuries [3-5]. Certain anatomical regions of the body are of particular clinical importance, one of which is the maxillofacial region. In fact, fractures of the maxillofacial area constitute a significant proportion of fractures resulting from various types of trauma. The maxillofacial region is one of the most sensitive areas of the human body, encompassing numerous vital structures and playing a crucial role in facial aesthetics. Therefore, appropriate management of injuries in this region is of high priority [6-7]. Facial fractures significantly affect function, facial form, and aesthetics. The mandible represents the second most commonly fractured facial bone after the nasal bone [8-9]. The maxillofacial region is among the most complex and important anatomical areas, containing essential bones and organs. Trauma to this region often results in damage to soft tissues, teeth, and critical components of the facial skeleton. Accurate diagnosis and proper management of these fractures are essential. Patients with such injuries require thorough clinical and radiographic examinations [10-12].

Maxillofacial fractures are common among trauma patients; however, their prevalence varies across regions depending on economic, cultural, environmental, and social factors. These fractures may occur in isolation or in association with other injuries, including trauma to the head, spine, chest, abdomen, pelvis, and extremities. In many cases, these injuries are severe and require complex treatment approaches, often associated with unfavorable outcomes [13]. Trauma can lead to various complications in patients, including anxiety, pain, and delirium. Maxillofacial trauma, in particular, may result in multiple psychological complications such as anxiety, depression, body image disturbances, and delirium [14-15]. Pain can cause numerous short- and long-term consequences, contributing to an unpleasant illness experience for patients [16-17]. Postoperative delirium (POD) is one of the common complications following various surgical procedures, particularly maxillofacial surgeries. Therefore, it is essential to investigate these complications and their associated factors to implement effective preventive and management strategies [18].

Therefore, considering the importance of maxillofacial trauma, this study aimed to determine the factors associated with preoperative anxiety, postoperative pain, and delirium in maxillofacial trauma patients after general anesthesia.

Methods

In this study, 100 patients who were admitted to hospital due to maxillofacial trauma were initially assessed. Of these, 91 patients met the inclusion criteria and were enrolled in the study.

Inclusion criteria

- Hospitalization in hospitals of Ilam City
- Age between 18 and 65 years old
- Undergoing surgery under general anesthesia
- Postoperative admission to the ICU

In our institution, patients undergoing maxillofacial trauma surgery under general anesthesia are routinely monitored in the ICU for the early postoperative period due to airway safety concerns and the risk of postoperative complications. Therefore, ICU admission was used as an operational criterion to ensure standardized postoperative monitoring and assessment of delirium and pain.

Exclusion criteria

- Patient transfer to another center
- Death
- Any condition leading to lack of cooperation during the study

Informed consent (from the patient or their legal guardian) was obtained at all stages of the study and was considered an essential inclusion requirement.

Data Collection Instruments

1. Demographic Information Form

This form included questions regarding age, gender, education level, cause of trauma, marital status, and history of previous hospital surgeries. Causes of trauma were categorized based on forensic medicine classifications, including road traffic accidents, falls from height, and assault.

2. Amsterdam Preoperative Anxiety and Information Scale (APAIS)

The APAIS consists of six items categorized into two dimensions: anxiety and need for information. The instrument is scored using a 5-point Likert scale. The total anxiety score ranges from 4 to 20, and the total information need score ranges from 2 to 10 [19-20].

3. CAM-ICU-7 Questionnaire

This instrument consists of seven items, with a total score ranging from 0 to 7. Higher scores indicate greater

severity of delirium [21–23].

4. Visual Analog Scale (VAS)

Pain intensity was assessed using the VAS score, ranging from 0 (no pain) to 10 (severe pain) [24].

Procedure

Patients admitted to hospitals in Ilam City due to maxillofacial trauma were screened for eligibility. Their eligibility and level of cooperation were evaluated by a collaborating associate professor of forensic medicine. Patients who met the inclusion criteria were enrolled in the study. Nine patients were excluded, and data analysis was ultimately conducted on 91 participants. After explaining the study objectives to the patients or their legal guardians and obtaining consent, the APAIS questionnaire was completed prior to surgery. The CAM-ICU-7 and VAS assessments were completed postoperatively. The collected data were entered into SPSS software (version 19) for analysis.

Data analysis was performed using independent t-tests, analysis of variance (ANOVA), and regression analysis.

Results

Based on the findings from the 91 patients included in the study, 73.6% were male, 95.6% were single, 63.7% had primary-level education, and 47.3% had been hospitalized due to road traffic accidents (Table 1). According to the results, the mean $\pm$ SD score of the patients on the APAIS–Anxiety scale was 11.39 ± 5.93 , indicating a moderate level of preoperative anxiety (Table 2). With respect to delirium classification, the results showed that 6.6% of the patients were categorized

as having no or mild delirium, 86.8% were categorized as having moderate delirium, and 6.6% were classified as having severe delirium (Table 3). Furthermore, the scores obtained from the APAIS-A and VAS Pain instruments were higher in female patients compared to males, indicating greater preoperative anxiety and postoperative pain among women ($P = 0.000$) (Table 4).

(Table 5) presents the association between different forensic trauma mechanisms and the psychological and clinical variables evaluated in the study. Comparison across groups shows significant differences in preoperative anxiety, information need, postoperative pain, and delirium severity.

The results show a strong positive correlation between preoperative anxiety and postoperative pain ($r=0.62$, $P<0.001$), indicating that higher anxiety is associated with greater pain after surgery. Anxiety also demonstrated a mild but significant correlation with information need ($r=0.22$, $P<0.03$). Information need showed a small but significant association with postoperative delirium ($r=0.27$, $P=0.008$). There was no significant correlation between anxiety and delirium ($P=0.75$). Additionally, postoperative pain showed a mild significant correlation with delirium ($r=0.25$, $P<0.014$) (Table 6). The multivariable logistic regression analysis indicated that postoperative pain (VAS) and information need (APAIS) were independently associated with postoperative delirium. Higher pain scores increased the odds of delirium by approximately 2.7 times. In contrast, preoperative anxiety and gender were not significant predictors. These findings are consistent with the correlation results reported in (Table 6), where pain and information need showed significant associations with delirium (Table 7).

Table 1- Demographic and Clinical Characteristics of the Patients (n = 91).

Variable	n (%) or mean $\pm$ SD
Age (years)	33.01 $\pm$ 11.71
Sex	
– Male	67 (73.6%)
– Female	24 (26.4%)
Marital status	
–Without a spouse (single, divorced, etc.)	87 (95.6 %)
–With a spouse	4 (4.4 %)
Educational level	
– Illiterate	16 (17.6 %)
– Primary	58 (63.7 %)
– High school	13 (14.3 %)
– University	4 (4.4 %)
Forensic evaluations of trauma mechanisms	
– Road traffic accident	43 (47.3 %)
– Fall from height	20 (22 %)
– Assault	24 (26.4 %)
– Others	4 (4.4 %)
History of previous surgery	
Yes	21 (23.1 %)
No	70 (76.9 %)

Table 2- Descriptive Statistics of Preoperative Anxiety, Information Need, Postoperative Pain, and Delirium Scores.

Variable	Minimum	Maximum	Mean $\pm$ SD
APAIS – Anxiety	4	20	11.39 $\pm$ 5.93
APAIS – Information Need	2	10	6.76 $\pm$ 2.39
VAS Pain Score	0	10	5.28 $\pm$ 2.05
CAM-ICU-7 score	0	7	4.30 $\pm$ 1.00

Table 3- Frequency of Delirium Severity According to CAM-ICU-7 Categories.

Delirium severity	Score range	n (%)
No/mild delirium	0–2	6 (6.6 %)
Moderate delirium	3–5	79 (86.8%)
Severe delirium	6–7	6 (6.6 %)

Table 4- Comparison of Anxiety, Pain, and Delirium Scores by Sex.

Outcome variable	Sex	Mean $\pm$ SD	Statistical test	P value
Preoperative anxiety (APAIS-A)	Male	9.43 $\pm$ 5.61	t-test	0.000
	Female	16.87 $\pm$ 2.19		
VAS Pain Score	Male	4.56 $\pm$ 1.48	t-test	0.00
	Female	7.29 $\pm$ 2.09		
CAM-ICU-7 score	Male	4.14 $\pm$ 0.98	t-test	0.01
	Female	4.75 $\pm$ 0.94		

Table 5- Relationship Between Forensic Trauma Mechanism and Clinical Variables.

Forensic Trauma Mechanism	APAIS–Anxiety (Mean $\pm$ SD)	APAIS–Information (Mean $\pm$ SD)	VAS Pain (Mean $\pm$ SD)	CAM-ICU-7 Delirium (Mean $\pm$ SD)
– Road traffic accident	13.51 $\pm$ 6.27	7.55 $\pm$ 1.36	6.02 $\pm$ 2.18	4.25 $\pm$ 1.02
– Fall from height	13.45 $\pm$ 3.20	6.90 $\pm$ 2.38	5.2 $\pm$ 2.09	4.0 $\pm$ 1.16
– Assault	5.41 $\pm$ 2.51	5.37 $\pm$ 3.20	4.20 $\pm$ 1.25	4.79 $\pm$ 0.58
– Others	14.25 $\pm$ 2.06	6.00 $\pm$ 2.4	4.25 $\pm$ 0.95	3.50 $\pm$ 1.00
P value, F	0.000, 16.87	0.003, 5.01	0.003, 5	0.01, 3.66

Table 6. Correlation Between Preoperative Anxiety, Information Need, Postoperative Pain, and Delirium.

Variables	APAIS-Anxiety	APAIS-Information	VAS Pain	CAM-ICU-7
APAIS – Anxiety	1	r = 0.22, P < 0.03	r = 0.62, P = 0.000	r = 0.033, P = 0.75
APAIS – Information Need		1	r = 0.15, P = 0.14	r = 0.27, P = 0.008
VAS Pain Score			1	r = 0.25, P < 0.014
CAM-ICU-7 score				1

Table 7- Multivariable Logistic Regression Analysis Predicting Postoperative Delirium in Maxillofacial Trauma Patients.

Variables	AOR	95% CI	P value
VAS Pain	2.7	1.2–4.4	0.006
APAIS-Information Need	1.3	1.1–2.1	0.02
APAIS-Anxiety	1.2	0.8–1.9	0.42
Gender	1.1	0.8–1.8	0.36

Discussion

Delirium is one of the postoperative complications, and studies conducted in Iran have reported its incidence ranging from 20% to 44% [25-26]. Therefore, this study was conducted to investigate the association between delirium and anxiety status as well as postoperative pain in patients undergoing anesthesia. According to the findings, the mean $\pm$ SD delirium score was 4.30 $\pm$ 1.00,

with 86.8% of patients falling within the moderate delirium range and 6.6% in the severe delirium category. In the study by Alhammadi et al., conducted on 90 patients undergoing maxillofacial surgery, 8.9% of the patients exhibited symptoms of delirium [27]. In a systematic review and meta-analysis by Alhammadi and colleagues (primarily involving head and neck cancer surgeries), 68 studies comprising 14,662 patients were analyzed, and the overall incidence of postoperative

delirium was reported to be approximately 9.6%. Major risk factors included advanced age, malnutrition, comorbidities (particularly cognitive and psychiatric disorders), alcohol consumption, prolonged surgery duration, blood loss, and oxygenation disturbances [28].

Based on the results of the present study, patients experiencing higher levels of pain showed higher rates of delirium. Concerning the relationship between delirium and pain, Leong et al., in a study with a sample size of 119,230 patients, demonstrated a correlational trend between pain and the occurrence of delirium [29]. In the study by Jooma, which examined preoperative anxiety and postoperative delirium in children undergoing dental procedures, anxiety was reported in 69.2% of children, while delirium occurred in 56.2% of them [30].

According to the findings, no significant correlation was found between APAIS–Anxiety and delirium ($r = 0.033$, $P = 0.75$), whereas a significant association was observed between APAIS–Information Need and delirium ($r = 0.27$, $P = 0.008$). In the study by Milisen et al., which utilized the APAIS tool for assessing anxiety, no association was found between delirium and anxiety [31]. However, in the meta-analysis by Yang and colleagues involving 1,691 participants, a significant relationship was observed between postoperative delirium (POD) and preoperative anxiety in elderly patients undergoing surgery. These inconsistencies may be attributed to differences in the age groups of participants and the anxiety assessment tools used across studies [32]. In the present study, the age range of participants had a mean $\pm$ SD of 33.01 ± 11.71 years, whereas Yang et al. focused on elderly populations. Moreover, most common anxiety assessment tools—including HADS-A and STAI-S—differed from the instrument used in this research.

Limitations

We agree and thank the reviewer for this suggestion. A dedicated limitations paragraph has now been added to the Discussion section. In this section, we acknowledge the cross-sectional design, the relatively small sample size ($n = 91$), the single-center nature of the study, the potential selection bias related to ICU admission, and the lack of blinding.

Conclusion

The findings of this study indicate that patients with maxillofacial trauma undergoing general anesthesia and ICU hospitalization experience moderate levels of preoperative anxiety and postoperative pain, and a considerable proportion of them display varying degrees of delirium, predominantly moderate in severity. Although no direct correlation was observed between preoperative anxiety and delirium, postoperative pain and a higher preoperative need for information showed

significant associations with delirium severity. Additionally, significant differences were identified based on gender and trauma mechanisms in terms of levels of anxiety, pain, and delirium. Overall, these results highlight the importance of assessing and managing anxiety, ensuring effective pain control, and providing adequate preoperative information to patients to improve psychological outcomes and reduce postoperative delirium severity.

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