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Research Article

Effect of quetiapine on arterial oxygen saturation on head trauma patients

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Abstract
Background: Traumatic brain injury (TBI) is considered a major global public health epidemic, economic and social issue as it is the main cause of death and disability in most countries. **Aim and objectives:** To assess and evaluate the efficacy and safety of Quetiapine in the management of agitated behaviors following traumatic brain injury (TBI) and its effect on arterial oxygen saturation **Patient and methods:** This prospective randomized controlled study conducted on 40 adult patients (divided into 2 equal groups, 20 cases each) aged 18-60 years old with isolated moderate TBI in trauma ICU of Minia University Hospital (MUH) starting from July 15, 2022. **Results:** There was a substantial variation between the two studied groups as regard arterial oxygen saturation readings which was significantly higher in group Q compared to group C in the 7th and 8th days. **Conclusion: Q**uetiapine was safe and effective in the management of agitated behaviors following traumatic brain injury (TBI) and improvement of arterial oxygen saturation.

Key words: TBI, Psychosis, Delirium, SO_2

Introduction
Traumatic brain injury (TBI) is considered a major global public health epidemic, economic and social issue affecting all societies. It is considered the main cause of death and disability in most countries. In recent years, patterns of injury have been changing, with more injuries, particularly contusions, occurring in older patients. [1,2]

Agitation and delirium occur in 70% of hospitalized patients with traumatic brain injury (TBI) and has adverse impacts on length of stay and functional outcomes. [5] Agitation can compromise patient safety through accidental removal of tubes and catheters, prolong the duration of stay in the ICU, and may be related to various complications. [3,4]

There is increasing evidence that Agitation and delirium can also lead to hypoxia and decreased arterial oxygen saturation readings in head trauma patients leading to increased length of ICU stay, the need and duration of mechanical ventilation and increased mortality. [6]

Certain drugs such as antipsychotics can reduce the incidence and severity of delirium and therefore improving oxygenation and arterial oxygen saturation readings. [7,8]

The goal of this work was to assess & evaluate the efficiency and safety of atypical antipsychotics (Quetiapine) in the improvement of arterial oxygen saturation readings when added to the management of agitated behaviors following traumatic brain injury (TBI).

Patient and Methods
This randomized controlled double blinded study conducted on 40 adult patients aged 18-60 years old with isolated moderate TBI, in trauma ICU of Minia University Hospital (MUH) starting from date July 15, 2022

Patients were divided into 2 groups: Group Q (n = 20): received Quetiapine (25 mg up to 100 mg once daily) in orogastric or nasogastric tube plus the conventional treatment from day of admission till day of discharge and Group C (n = 20): received conventional treatment only without any atypical antipsychotics.

Inclusion Criteria: Age between 18 and 60 years**,** Moderate Head Trauma Patients (GCS 9-12)**,** both sexes and no surgical interference requiring heavy sedation and muscle relaxation

Exclusion Criteria: Patients' first-degree relatives' refusal**,** age less than 18 or more than 60**,** Mild Head Trauma (GCS 12-15) or Severe Head Trauma (GCS less than 7)**,** pregnant women**,** allergy to study drugs**,** contraindication to enteral feeding and pre-existing brain dysfunction, impending brain herniotomy and Craniotomy.

Methods:

Every patient who was a part of the trial underwent the following: thorough history-taking, clinical examination, and research:(laboratory and radiological).

Procedures: Midazolam or propofol were the typical sedative regimens used in conventional therapy. We interrupted sedation once a day as per our hospital's practice. As long as a senior resident was present, analgesics (opioids) were permitted. For all groups, **Glasgow coma scale score** GCS score was measured every 8 hours, CT brain was repeated when needed. Arterial oxygen saturation reading was taken and recorded continuously by pulse oximetry and average readings were targeted. Arterial blood gases analysis was done daily and whenever needed.

Three factors make up the Glasgow Coma Scale: best motor response (M), best verbal response (V), and best ocular reaction (E). The Glasgow Coma Scale's reaction levels were "scored" from 1 (no response) to 6 (motor response), 5 (verbal response), and 4 (eye-opening response), which are the typical norms. With three being the lowest and fifteen being the greatest, the total Coma Score consequently has values between three and fifteen. The total of the constituent components' scores makes up the score. For instance, GCS10 = E3V4M3 might be used to represent a score of 10.

The primary outcome was improvement of arterial oxygen saturation associated with Agitation, Psychosis and Delirium developed in traumatic brain injury (TBI) patients at Intensive Care Unit (ICU)

Secondary outcomes: Determines ICU length of stay (ICU LOS), Follow up improvement and recovery of Glasco coma scale (GCS) of the patients.

Ethical consideration: Official approval from the ICU of Minya University Hospital (MUH) was acquired. Official approval from Institutional Research was obtained. approval from the medical faculty's Institutional Research Board (IRB) ethics committee. First-degree relatives of the patients provided written, informed permission. Both the service offered and the research methods had no negative impact on the participants.

Statistical analysis:

SPSS version 20 (Statistical Package for the Social Sciences) was utilized for data input, processing, and statistical analysis. The following significance tests were applied: Spearman's correlation, Wilcoxon's, Chi square, logistic regression analysis, and Kruskal-Wallis. Data were shown, and appropriate analysis was carried out based on the kind of data (parametric and non-parametric) that were collected for every variable. Statistical significance was defined as P-values < 0.05 (5%) and $P > 0.05$ (non-significant) and $P < 0.01$ (very significant) respectively. Descriptive statistics: median and inter-quartile range (IQR) for non-parametric numerical data, and mean, standard deviation ($\pm$ SD) and range for parametric numerical data. The proportion and frequency of non-numerical data. ANOVA in one direction for continuous variables with normal distribution. Following an ANOVA, post hoc analysis was carried out using the Mann-Whitney U test and the Tukey test.

Results

Table (1): Demographic data of the studied groups.

	Group Q (N=20)	**Control Group** (N=20)	**t/x²**	**P**
Age (years) Mean ± SD	38.8 ± 11.73	38.2 ± 13.05	0.152	0.879
Sex				
Female	9 (45%)	7 (35%)	0.417	0.518
Male	11 (55%)	13 (65%)		

P-value < 0.05: Significant

t: independent t test X^2: Chi square test.

This table showed that there was no significant difference between the studied groups regarding age and sex.

Table (2): SO_2 readings between the three studied groups.

	Group Q (N=20)	**Group C** (N=20)	**t**	**P**
1st day Mean ± SD	95.7 ± 1.7	95.44 ± 1.91	0.454	0.651
2nd day Mean ± SD	96.26 ± 1.57	95.45 ± 1.67	1.580	0.122
3rd day Mean ± SD	94.8 ± 1.87	95.65 ± 1.58	1.552	0.128
4th day Mean ± SD	95.5 ± 1.84	95.32 ± 1.79	0.313	0.755
5th day Mean ± SD	96.39 ± 1.9	96.11 ± 1.5	0.517	0.608
6th day Mean ± SD	95.89 ± 2.3	95.72 ± 1.63	0.269	0.788
7th day Mean ± SD	95.52 ± 1.5	96.6 ± 1.88	2.008	0.05
8th day Mean ± SD	98.96 ± 0.388	97.62 ± 2.27	2.602	0.013
9th day Mean ± SD	98.8 ± 0.447	97.75 ± 3.15	0.858	0.395

P-value < 0.05: Significant

t: independent t test

This table showed that There was a substantial variation between the two studied groups as regard SO_2 readings at **7th** and **8th** day.

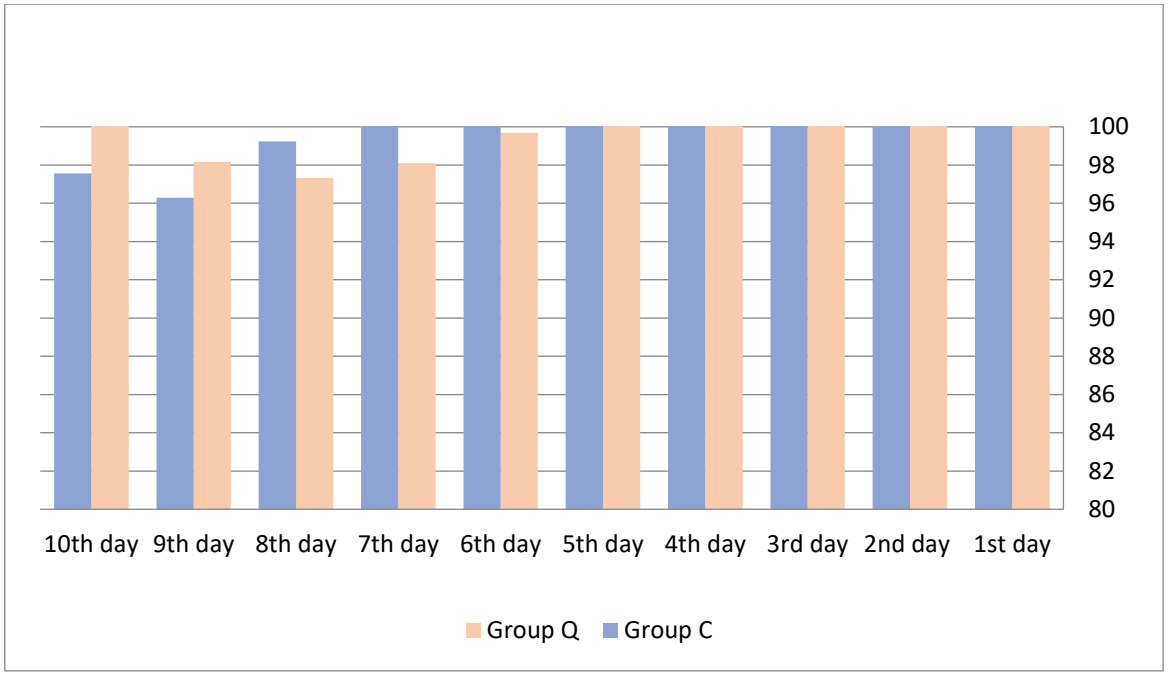

Figure (1): arterial oxygen saturation between the two studied groups.

Table (3): ICU stay duration between the studied groups.

	Group Q (N=20)	**Group C** (N=20)	**t**	**P**
ICU stay (days) Mean ± SD	6.9 ± 1.38	7.85 ± 1.46	**2.063**	**0.041**

P-value < 0.05: Significant
t : independent t test
This table showed that ICU stay was significantly lower in group Q compared to C.

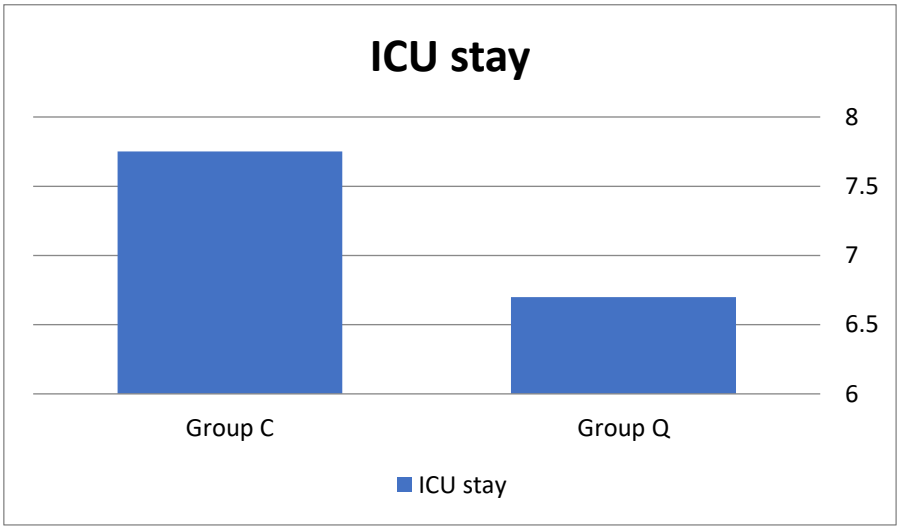

Figure (2): ICU stay duration between the studied groups

Table (4): GCS measurements between the two studied groups.

	Group Q (N=20)	**Group C** (N=20)	**F**	**P**
1st day Mean ± SD	8.75 ± 0.836	7.9 ± 0.745	.029	.985
2nd day Mean ± SD	11.34 ± 0.976	10.3 ± 0.913	.082	.974
3rd day Mean ± SD	13.0 ± 1.05	11.0 ± 1.08	.049	.942
4th day Mean ± SD	11.15 ± 0.853	11.42 ± 0.572	1.18	.315
5th day Mean ± SD	11.24 ± 0.447	12.0 ± 0.657	.508	.605
6th day Mean ± SD	12.42 ± 0.669	12.53 ± 0.811	.316	.794
7th day Mean ± SD	12.93 ± 0.604	14.0 ± 0.4167	**4.76**	**.018**
8th day Mean ± SD	13.19 ± 0.458	11.36 ± 0.786	.401	.354
9th day Mean ± SD	13.9 ± 0.518	14.64 ± 0.578	4.16	.142

F: One-way ANOVA test.

This table showed that There was a substantial variation between the two studied groups as regard GCS 7th day. Thus, GCS in the 7th day was significantly lower among group Q compared to group C.

Discussion

The current study showed that there was a substantial variation between the two studied groups as regard arterial oxygen saturation from 3rd to 9th day. spo2 was highest in the quetiapine group followed by control group.

This was supported by Welsion et al., who included 1347 patients received quetiapine (average age 44 years, 33.7% females) concluded that quetiapine was associated with higher oxygen saturations in the emergency setting and this was more prevalent in patients with preexisting pulmonary diseases. [10]

Exploring the outcomes of the study, regarding Glasgow Coma Scale (GCS), the current research showed that there was a substantial variation between the two studied groups as regard GCS 7th day. GCS 7th day was highest in quetiapine group followed by control group. However, there was no significant difference at other follow-up times. All the two groups showed comparable final GCS at 9th day which was significantly higher than GCS at the first day.

In agreement with the current study Aismaer et al., enrolled 438 critically ill traumatic brain injury patients, the study revealed that patients who received quetiapine showed significant increase in GCS at discharge compared to baseline. But in contrast to the current study, patients who received quetiapine had a greater median GCS at discharge (12 [11–14] vs. 11 [10–13]; $p < 0.01$) compared with those who did not receive quetiapine. **[11]**

Limitations: The current study was limited by small sample size, being a single center study and relatively short follow up period.

Conclusion

Quetiapine was safe and effective in the improvement of arterial oxygen saturations when used in the management of agitated behaviors following traumatic brain injury (TBI). However, this study established the

superiority of Quetiapine in the management of agitated behaviors following TBI as it associated with better improvement in Glasgow coma scale, improvement of arterial oxygen saturation and shorter ICU stay compared to conventional treatment. Further comparative studies with larger sample size and longer follow-up are needed to confirm our results and to identify risk factors of adverse events.

References

1. Coronado VG, McGuire LC, Faul M, Sugerman DE, Pearson WS. Traumatic brain injury epidemiology and public health issues. Brain injury medicine: Principles and practice. 2012 Aug 27; 84:84-100.
2. Roebuck-Spencer T, Cernich A. Epidemiology and societal impact of traumatic brain injury. Handbook on the neuropsychology of traumatic brain injury. 2014:3-23.
3. Phyland RK, Ponsford JL, Carrier SL, Hicks AJ, McKay A. Agitated behaviors following traumatic brain injury: a systematic review and meta-analysis of prevalence by post-traumatic amnesia status, hospital setting, and agitated behavior type. Journal of neurotrauma. 2021 Nov 15;38(22):3047-67.
4. McNett M, Sarver W, Wilczewski P. The prevalence, treatment and outcomes of agitation among patients with brain injury admitted to acute care units. Brain Injury. 2012 Aug 1;26(9):1155-62.
5. Maldonado JR. Delirium pathophysiology: an updated hypothesis of the etiology of acute brain failure. International journal of geriatric psychiatry. 2018 Nov; 33(11): 1428-57.
6. Bhalerao SU, Geurtjens C, Thomas GR, Kitamura CR, Zhou C, Marlborough M. Understanding the neuropsychiatric consequences associated with significant traumatic brain injury. Brain Injury. 2013 Jul 1;27(7-8):767-74.
7. Lonergan E, Britton AM, Luxenberg J. Antipsychotics for delirium. Cochrane database of systematic reviews. 2007(2).
8. Neufeld KJ, Yue J, Robinson TN, Inouye SK, Needham DM. Antipsychotic medication for prevention and treatment of delirium in hospitalized adults: a systematic review and meta-analysis. Journal of the American Geriatrics Society. 2016 Apr;64(4):705-14.
9. Chen Y, Mao H, Yang KH, Abel T, Meaney DF. A modified controlled cortical impact technique to model mild traumatic brain injury mechanics in mice. Frontiers in neurology. 2014 Jun 18; 5:100.
10. Welsion MP, Nordstrom K, Hopper A, Porter A, Castillo EM, Vilke GM. Risperidone in the emergency setting is associated with more hypotension in elderly patients. The Journal of Emergency Medicine. 2017 Nov 1;53(5):735-9.
11. Aismaer S, Lokhandwala A, Richards J, Bible L, Avila M, Castanon L, Ditillo M, Douglas M, Joseph B. The neuroprotective effect of quetiapine in critically ill traumatic brain injury patients. Journal of Trauma and Acute Care Surgery. 2020 Oct 1;89(4):775-82.