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The Status of Co-morbidities and Short Term Outcomes Among Electroconvulsive Therapy Patients: A Report from Guilan, Iran

Mehrad Sepaskhah [1], Soheil Soltanipour [2], Somayeh Shokrgozar [3], Reihane Einollahzade [4], Erfan Vakili [4], Gelareh Biazar [4,*]

[1] Student Research Committee, School of Medicine, Guilan University of Medical Sciences, Rasht, Iran
[2] Department of Community Medicine, School of Medicine, Guilan University of Medical Sciences, Rasht, Iran
[3] Department of Psychiatry, Kavosh Cognitive Behavior Sciences and Addiction Research Center, School of Medicine, Guilan University of Medical Sciences, Rasht, Iran
[4] Department of Anesthesiology, Anesthesiology Research Center, Alzahra Hospital, Guilan University of Medical Sciences, Rasht, Iran

[*] ***Corresponding Author:*** Department of Anesthesiology, Anesthesiology Research Center, Alzahra Hospital, Guilan University of Medical Sciences, Rasht, Iran. Email: gelarehbiazar1386@gmail.com

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Abstract

Background: Electroconvulsive therapy (ECT) is effective for many psychiatric disorders, particularly those resistant or refractory to pharmacotherapy and those requiring a rapid response. Despite the procedure's safety, high-risk patients require precautions and special attention.

Objectives: The present study aimed to determine the status of underlying diseases, high-risk conditions, and short-term outcomes in ECT patients.

Methods: This study was conducted at an academic psychiatric center in Guilan, Iran, from June 2023 to May 2024. Patients' demographic and clinical data were recorded. The patients were monitored for complications during the first 24 hours after the procedure.

Results: A total of 156 psychiatric patients who underwent ECT, with a mean age of 46.62 ± 14.14 years, participated in this study; among them, 83 (53.2%) were male. Bipolar disorder type 1 (36.5%) and schizophrenia (30.8%) were the most common diagnoses. Hyperlipidemia (28.8%) and diabetes (26.3%) were the most common underlying diseases. The results showed a statistically significant association between diabetes (P = 0.034), hypertension (P = 0.001), heart disease (P = 0.016), high Body Mass Index (BMI) (P = 0.023), and individuals' gender. A statistically significant association was also seen between diabetes (P = 0.003), hypertension (P = 0.026), high BMI (P = 0.066), and patients' age.

Conclusions: This study revealed that although a large number of ECT patients had at least one underlying disease or risky condition, no significant post-procedure complication was observed. This finding indicates the proper performance of the medical team as well as good communication between anesthesiologists and psychiatrists.

Keywords: Electroconvulsive Therapy, Patients, Co-morbidities, Guilan

1. Background

Electroconvulsive therapy (ECT) remains one of the most effective treatments for severe psychiatric disorders, particularly in cases resistant to pharmacotherapy or where a rapid clinical response is critical. This method is effective, safe, and practical, with several advantages compared to other treatment options. It is a simple and brief procedure with transient side effects; however, some cases are high risk and require necessary precautions to prevent complications (1, 2). The ECT was first used eighty years ago for the treatment of schizophrenia cases. However, it still remains stigmatized (3). In this clinical procedure, an electric current is passed through the brain to induce a brief seizure. The modern form of ECT

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is called modified ECT, in which the procedure is performed under general anesthesia with muscle relaxation (4). During the process, following sympathetic and parasympathetic nervous system activation, severe hemodynamic fluctuations occur (5, 6). Therefore, it is crucial to pay enough attention to patients' comorbidities. Obviously, for the safe management of ECT patients, proper communication between psychiatrists and anesthesiologists is essential. The growing prevalence of psychiatric disorders comorbid with medical conditions underscores the need for meticulous preoperative assessment and tailored anesthetic management during ECT. The anesthesia drugs can cause hemodynamic instability (7). As a result, it is recommended that before performing ECT, all necessary preparations and consultations be made similar to surgery patients (8). Hemodynamic changes in ECT patients are sometimes so severe that they can cause life-threatening cardiovascular and cerebral complications, which are especially noticeable in the elderly (5, 9). Also, in diseases such as diabetes, as these patients have autonomic disorders, they are more sensitive to sympathetic and parasympathetic changes and require more attention (6, 10). In patients with hypertriglyceridemia, it is frequently recommended to use alternative sedatives (10, 11), and in patients with high blood pressure, acute sympathetic and parasympathetic fluctuations are expected during ECT (12, 13). The most common causes of death during ECT are cardiac arrhythmias and acute coronary syndrome. The most common complication associated with ECT is craniofacial trauma, especially dental and tongue injuries. In addition, complications may occur in the respiratory system (prolonged apnea, aspiration pneumonia, bronchospasm), the nervous system (subarachnoid hemorrhage, subdural hematoma), or the cardiovascular system (Takotsubo cardiomyopathy) (14). In some cases, psychiatric patients, despite not being in ideal physical condition, are scheduled for emergency ECT, which sometimes results in death. Based on recent authoritative studies, the importance and necessity of optimal preparation of ECT patients before receiving the procedure have been emphasized more than ever, and it has been clearly reminded that necessary consultations should be carried out with regard to comorbidities (15). In fact, performing ECT in emergency conditions can lead to irreparable complications for the patient and legal conflicts for the treatment team.

2. Objectives

The present study aimed to determine the frequency of co-morbidities and outcomes in ECT patients at Shafa Educational and Medical Center, Guilan, Iran.

3. Methods

This descriptive cross-sectional study was conducted at Shafa Hospital, an academic and referral center affiliated with Guilan University of Medical Sciences (GUMS), from June 2023 to May 2024.

3.1. Inclusion Criteria

Psychiatric patients who were candidates for ECT, aged over 18 years, based on the American Society of Anesthesiologists (ASA) physical status classifications I-III.

3.2. Exclusion Criteria

Unwillingness to participate in the study. In cases of eligibility, informed consent was obtained from the patient or, if necessary, from a legal guardian. A checklist containing demographic data, comorbidities, and high-risk conditions, including pregnancy, obesity, and old age, was completed. The Body Mass Index (BMI) is calculated by dividing an adult's weight in kilograms by their height in meters squared. Values between 18.5 and 24.9 kg/m^2 are described as the 'healthy range', between 25 and 29.9 kg/m^2 as overweight, and between 30 and 39.9 kg/m^2 as obesity. In this study, values equal to or higher than 25 kg/m^2 were considered high BMI (16). Elderly was defined as a person 65 years old or older (17).

3.3. Anesthesia Management

All ECT patients underwent a standard preoperative visit based on a prepared checklist for this purpose (18) and were fasted for 6 - 8 hours before the procedure. Atropine sulfate (0.01 mg/kg IM) was administered 30 minutes before the procedure to restrict airway secretions. Immediately after admission, standard monitoring, including pulse oximetry (POM), electrocardiography (ECG), and non-invasive blood pressure (NIBP), was performed, and a peripheral

intravenous access was secured, and hydration with crystalloids was started. Anesthesia was induced by propofol (1 mg/kg IV) followed by 0.5 mg/kg succinylcholine (500 mg/10 mL, Caspian Tamin Co, Iran). When the patient was completely unconscious, active hyperventilation at a rate of 40 - 50 breaths per minute was performed via a properly sized face mask, and a mouth guard was placed. After placing bitemporal electrodes, a grand-mal seizure was induced with the following characteristics: 70 - 120 V, 800 mA of direct current with a duration of 100 ms to 6 s, and active ventilation was started at the end of the seizure movements until the patient's spontaneous breathing resumed. When the patients were fully conscious with stable hemodynamic status, they were transferred to the recovery ward and underwent close monitoring to meet Aldrete scoring criteria. The patients were monitored for detecting complications both during the ECT procedure and the first 24 hours after ECT. Furthermore, the patients were followed for suicide during the first year after ECT.

3.4. Statistical Analysis

The gathered data were analyzed using SPSS version 21 (IBM Corporation, Inc., Chicago, IL, USA) and presented using descriptive statistics, frequency, mean, standard deviation, or median. The chi-square test was applied to analyze categorical variables. A P-value of less than 0.05 indicated statistical significance.

4. Results

A total of 156 psychiatric patients who underwent ECT, with a mean age of 46.62 ± 14.14 years and a mean BMI of 26.73 ± 2.71, participated in this study. Of these, 83 (53.2%) were male and 73 (46.8%) were female. The majority of the patients were in ASA class II (Table 1). In terms of psychiatric diagnosis, bipolar disorder type 1 (36.5%) and schizophrenia (30.8%) were the most common medical diagnoses. Our results demonstrated that a significant proportion of ECT recipients (87.8%) had at least one underlying medical condition, with hyperlipidemia (28.8%) and diabetes (26.3%) being the most prevalent (Table 2). The results showed a statistically significant association between diabetes (P = 0.034), hypertension (P = 0.001), heart disease (P = 0.016), high BMI (P = 0.023), and individuals' gender (Table 3). A statistically significant association was also seen between diabetes (P = 0.003), hypertension (P = 0.026), high BMI (P = 0.066), and patients' age (Table 4). During the follow-up period, no patient was affected by adverse events, and no case of suicide was reported.

Table 1. Patients' Demographic Data [a]

Variables	Values
Gender	
Male	83 (53.2)
Female	73 (46.8)
Age (y)	
≤ 40	58 (37.2)
41 - 65	83 (53.2)
> 65	15 (9.6)
Age (y)	46.62 ± 14.14 (14 - 79)
BMI (Kg/m ^{2})	26.73 ± 2.71 (21.5 - 34.1)
ASA	
I	115 (73.7)
II	41 (26.3)

Abbreviations: BMI, Body Mass Index; ASA, American Society of Anesthesiologists.

[a] Values are expressed as No. (%) or mean ± SD (range).

Table 2. Patients' Co-morbidities and Risky Conditions

Risk Factors	No. (%)
Diabetes	41 (26.3)
Hypertension	20 (12.8)
Cardiac disease	19 (12.2)
Hyperlipidemia	45 (28.8)
History of allergies	5 (3.2)
Seizures	13 (8.3)
Respiratory diseases	2 (1.3)
Thyroid diseases	8 (5.1)
Liver diseases	3 (1.9)
Renal diseases	1 (0.6)
Other co-morbidities	9 (5.8)
Pregnancy	2 (2.7)
Age above 65	15 (9.6)
High BMI	13 (8.3)
One underlying diseases	112 (71.8)
Two underlying diseases	21 (13.5)
Three or more underlying diseases	4 (2.6)

Abbreviation: BMI, Body Mass Index.

5. Discussion

While previous studies have explored the safety and efficacy of ECT, there remains a gap in comprehensive data regarding the frequency of comorbidities and their

Table 3. The Relationship Between Gender and Health Status of Studied Electroconvulsive Therapy Patients [a]

Risk Factors	Male	Female	P-Value
Diabetes	16 (19.3)	25 (34.2)	0.034
Hypertension	4 (4.8)	16 (21.9)	0.001
Cardiac disease	15 (18.1)	4 (5.5)	0.016
Hyperlipidemia	27 (32.5)	18 (24.7)	0.279
History of allergies	4 (4.8)	1 (1.4)	0.372
Seizures	8 (9.6)	5 (6.8)	0.529
Respiratory diseases	2 (2.4)	0 (0)	0.499
Thyroid diseases	3 (3.6)	5 (6.8)	0.475
Liver diseases	3 (3.6)	0 (0)	0.248
Renal diseases	0 (0)	1 (1.4)	0.468
Other co-morbidities	3 (3.6)	6 (8.2)	0.306
Age above 65	5 (6)	10 (13.7)	0.105
High BMI	3 (3.6)	10 (13.7)	0.023
No underlying diseases	5 (6)	14 (19.2)	0.0001
One underlying diseases	72 (86.7)	40 (54.8)	0.0001
Two underlying diseases	5 (6)	16 (21.9)	0.0001
Three or more underlying diseases	1 (1.2)	3 (4.1)	0.0001

Abbreviation: BMI, Body Mass Index.

[a] Values are expressed as No. (%).

impact on outcomes in diverse populations. According to the results of this study, a total of 156 eligible psychiatric patients who underwent ECT were enrolled. In total, 12.2% of patients had no comorbidities, and 2.6% had three concurrent diseases. Notably, our study revealed significant associations between specific comorbidities and demographic factors. For instance, diabetes and hypertension were more prevalent in older patients (P = 0.003 and P = 0.026, respectively), while high BMI was more common in younger individuals (P = 0.066). These findings are consistent with global trends in metabolic disorders among psychiatric populations.

2.6% of patients were in the elderly age group, which can present significant challenges for anesthesiologists. Due to comorbidities and cardiovascular problems, they require complete assessment before anesthesia. Choosing the right anesthetic drug for the elderly requires special attention because they are at risk of hemodynamic instability, and on the other hand, there are interactions of anesthetic drugs with seizure quality (14). Elderly patients who suffer from serious mood disorders are at risk of poor nutritional status and improper control of underlying diseases such as blood pressure and diabetes (19-21). No cases of mortality or serious complications were reported in this age group. This result aligns with the study by Rhee et al., which showed that the suicide rate in the elderly who underwent ECT treatment was lower than in those who underwent drug treatment. They also did not report any serious complications in their study (22).

In terms of diagnosis, the most common cases of hospitalization were for bipolar disorder. According to existing research, this mood disorder has often been one of the common disorders in psychiatry (23). A total of 26.3% of patients had diabetes, but no complications occurred. Diabetic patients are more susceptible to

Table 4. The Relationship Between Age and Health Status of Studied Electroconvulsive Therapy Patients [a]

Risk Factors and Status	Age ≤ 40	Age 41 - 65	Age > 65	P-Value
Diabetes				0.003
Yes	7 (11.2)	31 (37.3)	3 (20)	
No	51 (87.9)	52 (62.7)	12 (80)	
Hypertension				0.026
Yes	2 (4.3)	15 (18.1)	3 (20)	
No	56 (96.6)	68 (81.9)	12 (80)	
Cardiac disease				0.107
Yes	5 (6.8)	14 (16.9)	0 (0)	
No	53 (91.4)	69 (83.1)	15 (100)	
Hyperlipidemia				0.075
Yes	21 (36.2)	23 (27.7)	1 (7)	
No	37 (63.8)	60 (72.3)	14 (93)	
History of allergy				0.496
Yes	2 (4.3)	2 (2.4)	1 (7)	
No	56 (96.6)	81 (97.6)	14 (93)	
Seizure				0.129
Yes	8 (13.8)	5 (6.0)	0 (0)	
No	50 (86.2)	78 (94.0)	15 (100)	
Respiratory disease				0.184
Yes	0 (0)	1 (1.2)	1 (7)	
No	58 (100)	82 (98.8)	14 (93)	
Thyroid disease				0.086
Yes	6 (10.3)	2 (2.4)	0 (0)	
No	52 (89.7)	81 (97.6)	15 (100)	
Liver disease				0.539
Yes	2 (4.3)	1 (1.2)	0 (0)	
No	56 (96.6)	82 (98.8)	15 (100)	
Renal disease				0.682
Yes	0 (0)	0 (0)	1 (7)	
No	58 (100)	83 (100)	14 (93)	
Other comorbidities				0.966
Yes	3 (5.2)	5 (6.0)	1 (7)	
No	55 (94.8)	78 (94.0)	14 (93)	
High BMI				0.066
Yes	9 (15.5)	4 (4.8)	0 (0)	
No	49 (84.5)	79 (95.2)	15 (100)	

Abbreviation: BMI, Body Mass Index.

[a] Values are expressed as No. (%).

hemodynamic instability due to disorders in the autonomic system (24). Also, kidney involvement, cardiac, and neurological problems should be considered (21). In line with previous studies (25), the frequency of diabetes was higher among people with mood disorders (26). A total of 12.8% of the patients were hypertensive and also completed the ECT sessions without any complications. Hypertensive patients present challenges for the anesthesiologist and should be evaluated before anesthesia (27).

Another concern in ECT patients is post-electroshock suicides, which indicate treatment failure, but no report was received in this study. This result was found in this study, but it should be noted that many studies have mentioned suicide after the end of the ECT course as a challenge. The absence of post-ECT suicides in our study contrasts with some literature suggesting an increased short-term suicide risk following ECT (28). However, this discrepancy may reflect differences in follow-up duration or patient selection. Notably, our cohort included a higher proportion of bipolar disorder (36.5%)

compared to severe unipolar depression, which has been linked to higher post-ECT suicide risk (28-30). On the other hand, it cannot be definitively judged that the treatment response rate was higher in this center. Unlike many other studies, patients' initial attitude towards suicide or their attempts in this regard were not questioned, and they were generally studied. Additionally, post-ECT suicide appears to be more common among certain conditions such as major depression, which was not considered in this study (28). Non-response to ECT treatment has different causes, one of which is ineffective seizures in the context of anesthetic drug interactions on seizure quality. Therefore, the uncomplicated and complete course of ECT consecutive sessions indicates successful teamwork, including psychiatrists, anesthesiologists, and ECT staff. Comparing these findings with previous studies shows promising results, which can be due to the numerous studies conducted in different areas in this hospital, which explored some essential interventions to maintain patient safety (31, 32). Indeed, despite these comorbidities, no major adverse events were reported during or after ECT, underscoring the safety of the procedure when proper protocols are followed. A study was conducted in which a checklist was developed to prepare ECT patients. The purpose of this checklist was to ensure that patients undergo the procedure in optimal conditions after adequate evaluations (18). Also, the acceptable results in this study indicate appropriate coordination between the psychiatrist and the anesthesiologist.

5.1. Conclusions

This study emphasizes the importance of physicians being aware of the details of the medical center where they work, which was clearly revealed by this study. The results showed that, despite the high prevalence of comorbidities, no significant complications were observed during the procedure and follow-up time, indicating the importance of involved psychiatrists and anesthesiologists always following standard protocols for these patients. Special attention should be paid to their medical conditions, which may be overlooked due to their mental status.

5.2. Limitations

This study provided valuable information. However, a few limitations should be considered. It was a single-center study with a small sample size. Furthermore, a number of patients' families refused to answer our follow-up phone calls, so these patients were excluded from the survey. It can be assumed that patients' families who were affected by adverse outcomes such as death may be among this group who left the survey. Another limitation of this study is that other variables such as patients' marital status, occupation, and more high-risk conditions were not recorded.

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Footnotes

Authors' Contribution: Study concept and design: M. S. and G. B.; Acquisition of data: S. Sh. and R. E.; Analysis and interpretation of data: S. S. and E. V.; Drafting of the manuscript: G. B.; Critical revision of the manuscript for important intellectual content: G. B.; Statistical analysis: S. S.; Study supervision: G. B.

Conflict of Interests Statement: The authors declare no conflict of interests.

Data Availability: Related data of this study are available upon request.

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References

1. Kayalha H, Khezri M, Rastak S, Mehdi Pour H, Sofiabadi M. [Comparison of the Hemodynamic Effects of Two Anesthetics; Sodium Thiopental and Propofol in Patients Undergoing Electroconvulsive Therapy]. *J Ardabil Univ Med Sci.* 2018;**18**(3):357-66. FA. https://doi.org/10.29252/jarums.18.3.357.

2. Sauvaget A, Bulteau S, Galvao F, Szekely D, Fossati P, Poulet E. ECT: An essential therapy in psychiatry. *Encephale*. 2023;**49**(1):103-6. [PubMed ID: 35973849]. https://doi.org/10.1016/j.encep.2022.05.002.
3. de Mangoux GC, Amad A, Quiles C, Schurhoff F, Pignon B. History of ECT in Schizophrenia: From Discovery to Current Use. *Schizophr Bull Open*. 2022;**3**(1):sgac053. [PubMed ID: 39144764]. [PubMed Central ID: PMC11205978]. https://doi.org/10.1093/schizbullopen/sgac053.
4. Thirthalli J, Sinha P, Sreeraj VS. Clinical Practice Guidelines for the Use of Electroconvulsive Therapy. *Indian J Psychiatry*. 2023;**65**(2):258-69. [PubMed ID: 37063631]. [PubMed Central ID: PMC10096214]. https://doi.org/10.4103/indianjpsychiatry.indianjpsychiatry_491_22.
5. Wajima Z. Anesthesia Management of Special Patient Populations Undergoing Electroconvulsive Therapy: A Review. *J Nippon Med Sch*. 2019;**86**(2):70-80. [PubMed ID: 31130568]. https://doi.org/10.1272/jnms.JNMS.2019_86-202.
6. Stefan S, Alzedaneen Y, Whitlatch HB, Malek R, Munir K. Effects of Electroconvulsive Therapy on Glycemic Control in Type 1 Diabetes. *Cureus*. 2022;**14**(10). https://doi.org/10.7759/cureus.30222.
7. Dai X, Zhang R, Deng N, Tang L, Zhao B. Anesthetic Influence on Electroconvulsive Therapy: A Comprehensive Review. *Neuropsychiatr Dis Treat*. 2024;**20**:1491-502. [PubMed ID: 39100572]. [PubMed Central ID: PMC11298179]. https://doi.org/10.2147/NDT.S467695.
8. Sundsted KK, Burton MC, Shah R, Lapid MI. Preanesthesia medical evaluation for electroconvulsive therapy: a review of the literature. *J ECT*. 2014;**30**(1):35-42. [PubMed ID: 24091900]. https://doi.org/10.1097/YCT.0b013e3182a3546f.
9. Sun R, Liu H, Wang X. Mediastinal Emphysema, Giant Bulla, and Pneumothorax Developed during the Course of COVID-19 Pneumonia. *Korean J Radiol*. 2020;**21**(5):541-4. [PubMed ID: 32207255]. [PubMed Central ID: PMC7183834]. https://doi.org/10.3348/kjr.2020.0180.
10. Rasmussen KG, Ryan DA, Mueller PS. Blood glucose before and after ECT treatments in Type 2 diabetic patients. *J ECT*. 2006;**22**(2):124-6. [PubMed ID: 16801828]. https://doi.org/10.1097/00124509-200606000-00009.
11. Heybati K, Deng J, Xie G, Poudel K, Zhou F, Rizwan Z, et al. Propofol, Triglycerides, and Acute Pancreatitis: A Multicenter Epidemiologic Analysis. *Ann Am Thorac Soc*. 2025;**22**(2):235-46. [PubMed ID: 39393346]. [PubMed Central ID: PMC11808550]. https://doi.org/10.1513/AnnalsATS.202407-781OC.
12. Albin SM, Stevens SR, Rasmussen KG. Blood pressure before and after electroconvulsive therapy in hypertensive and nonhypertensive patients. *J ECT*. 2007;**23**(1):9-10. [PubMed ID: 17435564]. https://doi.org/10.1097/01.yct.0000263252.75926.98.
13. Hermida AP, Mohsin M, Marques Pinheiro AP, McCord E, Lisko JC, Head LW. The Cardiovascular Side Effects of Electroconvulsive Therapy and Their Management. *J ECT*. 2022;**38**(1):2-9. [PubMed ID: 34699395]. https://doi.org/10.1097/YCT.0000000000000802.
14. Wojdacz R, Antosik-Wójcińska A, Święcicki Ł. Complications of general anaesthesia in electroconvulsive therapy. *Pharmacotherapy Psychiatry Neurol*. 2021;**37**(3-4):245-57. https://doi.org/10.5114/fpn.2021.115555.
15. Bansal S, Surve RM, Dayananda R. Challenges during Electroconvulsive Therapy—A Review. *J Neuroanaesthesiol Critical Care*. 2021;**8**(3):173-9. https://doi.org/10.1055/s-0041-1731627.
16. Khanna D, Peltzer C, Kahar P, Parmar MS. Body Mass Index (BMI): A Screening Tool Analysis. *Cureus*. 2022;**14**(2). https://doi.org/10.7759/cureus.22119.
17. Agresta F, Bergamini C, Podda M, Campanile FC, Anania G, Volpato S, et al. How to Define an Elderly and Frail Patient? In: Agresta F, Podda M, Campanile FC, Bergamini C, Anania G, editors. *Emergency laparoscopic surgery in the elderly and frail patient*. Cham, Germany: Springer International Publishing; 2021. p. 3-18. https://doi.org/10.1007/978-3-030-79990-8_1.
18. Abdollahi E, Pourramzani A, Sedighinejad A, Soltanipour S, Soleimani R, Isanazar A, et al. Evaluation of the Efficacy of the ECT Patients Preparation Checklist in Reducing the Cancellation Rate in an Academic Hospital. *Shiraz E-Med J*. 2022;**23**(12). https://doi.org/10.5812/semj-124049.
19. Amornyotin S. Anesthetic Consideration for Geriatric Patients. In: Amornyotin S, editor. *Update in Geriatrics*. London, England: IntechOpen; 2021. https://doi.org/10.5772/intechopen.97003.
20. Bolukbasi G, Dundar N. Oral health in older adults: current insights and tips. *J Gerontol Geriatrics*. 2024;**72**(2):96-107. https://doi.org/10.36150/2499-6564-n700.
21. Galway U, Chahar P, Schmidt MT, Araujo-Duran JA, Shivakumar J, Turan A, et al. Perioperative challenges in management of diabetic patients undergoing non-cardiac surgery. *World J Diabetes*. 2021;**12**(8):1255-66. [PubMed ID: 34512891]. [PubMed Central ID: PMC8394235]. https://doi.org/10.4239/wjd.v12.i8.1255.
22. Rhee TG, Sint K, Olfson M, Gerhard T, H. Busch S, Wilkinson ST. Association of ECT With Risks of All-Cause Mortality and Suicide in Older Medicare Patients. *Am J Psychiatry*. 2021;**178**(12):1089-97. [PubMed ID: 34503341]. [PubMed Central ID: PMC8639649]. https://doi.org/10.1176/appi.ajp.2021.21040351.
23. National Institute for Health, British Psychological Society; National Collaborating Centre for Mental Health; Clinical Excellence; Royal College of Psychiatrists. *Common Mental Health Disorders: Identification and Pathways to Care*. Leicester, England: British Psychological Society; 2011.
24. Moningi S, Nikhar S, Ramachandran G. Autonomic disturbances in diabetes: Assessment and anaesthetic implications. *Indian J Anaesth*. 2018;**62**(8):575-83. [PubMed ID: 30166651]. [PubMed Central ID: PMC6100274]. https://doi.org/10.4103/ija.IJA_224_18.
25. N. C. D. Risk Factor Collaboration. Worldwide trends in diabetes prevalence and treatment from 1990 to 2022: a pooled analysis of 1108 population-representative studies with 141 million participants. *Lancet*. 2024;**404**(10467):2077-93. [PubMed ID: 39549716]. [PubMed Central ID: PMC7616842]. https://doi.org/10.1016/S0140-6736(24)02317-1.
26. Martin H, Bullich S, Guiard BP, Fioramonti X. The impact of insulin on the serotonergic system and consequences on diabetes-associated mood disorders. *J Neuroendocrinol*. 2021;**33**(4). e12928. [PubMed ID: 33506507]. https://doi.org/10.1111/jne.12928.
27. Fernandez-Candil J, Castelltort Masco L, Fabregas Julia N, Urretavizcaya Sarachaga M, Bernardo Arroyo M, Valero Castell R. Anaesthesia in electroconvulsive therapy. Special conditions. *Rev Psiquiatr Salud Ment (Engl Ed)*. 2020;**13**(1):36-46. [PubMed ID: 30078550]. https://doi.org/10.1016/j.rpsm.2018.05.002.
28. Kaster TS, Blumberger DM, Gomes T, Sutradhar R, Wijeysundera DN, Vigod SN. Risk of suicide death following electroconvulsive therapy treatment for depression: a propensity score-weighted, retrospective cohort study in Canada. *Lancet Psychiatry*. 2022;**9**(6):435-46. [PubMed ID: 35487236]. https://doi.org/10.1016/S2215-0366(22)00077-3.
29. Watts BV, Peltzman T, Shiner B. Electroconvulsive Therapy and Death by Suicide. *J Clin Psychiatry*. 2022;**83**(3). [PubMed ID: 35421285].

https://doi.org/10.4088/JCP.21m13886.

30. Salagre E, Rohde C, Ostergaard SD. Self-Harm and Suicide Attempts Preceding and Following Electroconvulsive Therapy: A Population-Based Study. *J ECT*. 2022;**38**(1):13-23. [PubMed ID: 34519684]. https://doi.org/10.1097/YCT.0000000000000790.
31. Rimaz S, Soleimani R, Khoshrang H, Emir Alavi C, Biazar G, Ahmadi M, et al. Electroconvulsive Therapy Side Effects in Recovery Ward: A Report From the North of Iran. *Caspian Journal of Neurological Sciences*. 2020;**6**(2):94-9. https://doi.org/10.32598/cjns.6.21.96.1.
32. Soleimani R, Ghazanfar Tehran S, Eslami Kenarsari H, Montazery B, Khoshnoud Speily S, Mirzababaei S, et al. Hemodynamic Status in Electroconvulsive Therapy Patients. *Journal of Guilan University of Medical Sciences*. 2022;**31**(3):218-31. https://doi.org/10.32598/jgums.31.3.1329.4.