

**PATTERN OF ELECTROCONVULSIVE THERAPY USE AMONG PATIENTS
ATTENDING PSYCHIATRIC CONSULTATIONS IN MOSUL CITY – A CROSS
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ABSTRACT

Electroconvulsive therapy (ECT) is a safe and effective psychiatric treatment that induces brief therapeutic seizures under general anesthesia and muscle relaxation. It is mainly used for severe depression, catatonia, bipolar disorder, and neuroleptic malignant syndrome, especially when rapid improvement is needed or medications fail. Despite its proven efficacy, ECT remains controversial in some societies due to misconceptions, although its regulated use in many countries highlights its important therapeutic role. This descriptive cross-sectional study aimed to determine the pattern of ECT use among patients who attended psychiatric consultations in Mosul City. The study included 130 patients referred for ECT at Ibn Senna and Al-Salam Teaching Hospitals in Mosul, Iraq, between March and July 2025. Demographic data, clinical characteristics, ECT indications, frequency, and outcomes were collected using a structured questionnaire. Of the 130 patients, 77 (59.2%) were male and 53 (40.8%) were female; low socioeconomic status was predominant (84.6%); the most frequent diagnoses were schizophrenia (39.2%) and depression (26.2%); and pharmacological treatment resistance was the main indication for ECT (67.7%). Most patients (98.5%) showed clinical improvement, with patients with schizophrenia predominantly showing moderate improvement (60.8%), patients with depression showing marked improvement (38.2%), and patients with bipolar disorder and acute brief psychosis showing moderate improvement (78.9% and 69.2%, respectively). Improvement rates were high regardless of prior ECT history, and adverse effects were reported in 23.1% of patients, most commonly headache (12.3%), transient memory loss (3.1%), and confusion (1.5-3.9%), while 76.9% experienced no side effects. ECT is highly effective for patients with severe psychiatric disorders and is generally well tolerated, with adverse effects mostly mild and transient. These findings support the continued and safe use of ECT in psychiatric care, particularly for patients unresponsive to pharmacological treatments.

KEYWORDS: Electroconvulsive Therapy, Schizophrenia, Depression, Psychiatric Consultations, Mosul, Iraq.**1. INTRODUCTION**

Electroconvulsive therapy (ECT) is a well-established psychiatric intervention that induces a brief, controlled therapeutic seizure under general anesthesia and muscle relaxation. It is primarily used for severe depression, catatonia, bipolar disorder, and neuroleptic malignant syndrome, particularly when rapid clinical improvement is needed or when pharmacological treatment has failed. Despite its proven efficacy and safety, ECT remains controversial in some communities due to persistent

misconceptions, although its regulated use in many countries underscores its continued importance as a major therapeutic option.^[1]

1.1 Background and Mechanism of Action

The therapeutic potential of induced seizures in psychiatric illness was first explored using chemical convulsants in the 1930s, but electrical induction, introduced by Celletti and Bini in 1938, proved more consistent and marked the formal beginning of ECT;

Lothar Kalinowsky performed the first ECT session in the United States in 1940, and institutional endorsement followed, with the American Psychiatric Association issuing its first ECT Task Force Report in 1978 and the NIH/NIMH Consensus Conference formally recognizing ECT as a legitimate therapeutic option in 1985.^[2] In Iraq, ECT was introduced in 1946 at psychiatric hospitals in Baghdad for schizophrenia, with both modified and unmodified techniques used initially; unmodified ECT was officially discontinued in 2009 in line with international clinical standards.^[3]

Although the precise mechanism of action remains incompletely understood, several interrelated neurobiological systems are believed to be involved. ECT enhances monoaminergic neurotransmission, particularly by increasing the release and modulating the sensitivity of presynaptic receptors for serotonin, dopamine, and norepinephrine, all of which are central to mood regulation.^[4] It also activates the hypothalamic-pituitary axis, leading to transient elevations in hormones such as prolactin, adrenocorticotrophic hormone, thyroid-stimulating hormone, and endorphins, which may further contribute to the rapid improvement in mood and affective symptoms. Neuroimaging findings suggest that ECT reduces hyperactivity in the frontal and cingulate cortices, regions implicated in depression and emotional dysregulation. Functional and structural MRI studies have demonstrated increased connectivity between the hippocampus and fronto-limbic regions following treatment. According to the neurotrophic hypothesis, ECT may promote neurogenesis and enhance brain-derived neurotrophic factor levels, potentially reversing structural changes, such as hippocampal atrophy commonly observed in depression, alongside anticonvulsant and GABAergic effects. Quantitative EEG studies have further shown increased delta-wave activity after treatment, indicating a shift toward a more regulated neural rhythm, while genetic variability may also influence individual response, although this remains under ongoing investigation.^[4]

1.2 Indications and Contraindications

ECT is indicated for selected psychiatric conditions, particularly when patients exhibit poor response to pharmacological treatment, have severe symptoms, or require rapid clinical stabilization. In major depressive disorder, ECT is particularly indicated in severe cases, especially when accompanied by psychotic features, suicidal ideation, or treatment resistance.^[5] In schizophrenia, a chronic illness marked by disturbances in perception, thought, emotion, and behavior, ECT serves as an adjunctive treatment in refractory cases when first- or second-generation antipsychotics, including clozapine, prove insufficient, and is particularly effective in managing catatonic presentations. In bipolar disorder, ECT may be administered during any phase of illness, whether depressive, manic, or mixed, especially with psychotic features, treatment resistance, or immediate suicide risk.

ECT has also been reported as a beneficial intervention for neuroleptic malignant syndrome, a rare, life-threatening reaction to antipsychotic drugs characterized by muscle rigidity, hyperthermia, autonomic instability, and altered mental status. Other indications include severe agitation or aggression in dementia that is resistant to pharmacological and non-pharmacological treatment, where ECT may be considered as a last resort, and select cases of Parkinson's disease accompanied by severe depression or other specific seizure-related or neuropsychiatric conditions.^[5]

ECT is generally regarded as a safe and well-tolerated procedure; elevated intracranial pressure, regardless of cause, whether from brain tumors, recent stroke, head trauma, or other intracranial pathology, is considered the only absolute contraindication. Several conditions are considered relative contraindications, meaning that ECT may still be administered under strict medical supervision and with appropriate modifications, including recent myocardial infarction within the preceding 4 to 6 weeks; severe cardiovascular disease such as unstable angina, uncontrolled hypertension, aortic aneurysm, or congestive heart failure; cerebrovascular disease, especially with a history of stroke or transient ischemic attack; high-risk anesthesia history; ophthalmic concerns such as retinal detachment or recent eye surgery; and severe pulmonary disease, such as advanced chronic obstructive pulmonary disease. In these cases, ECT may still be used with precautions, including medical optimization, intensive care unit monitoring, or anesthesia modification.^[5]

A comprehensive pre-ECT medical and psychiatric evaluation, including cardiovascular, pulmonary, and cognitive assessment, is recommended before treatment initiation to ensure patient safety.^[5]

1.3 General Medical Adverse Effects

ECT is among the safest procedures performed under general anesthesia, with mortality rates generally ranging from less than 1 to 4 deaths per 100,000 treatments, comparable to minor procedures performed under anesthesia; most fatalities relate to cardiopulmonary complications, particularly in patients with underlying cardiac disease.^[6] Other reported general medical adverse effects include aspiration pneumonia in inadequately fasted patients, fractures in patients with severe osteoporosis, dental or tongue injury from inadequate oral protection, headache that is usually mild and managed with analgesics, transient nausea related to anesthesia, and other mild somatic symptoms, such as myalgia and jaw discomfort; concerns about structural brain damage from ECT have been disproven by numerous human and animal studies.^[6]

1.4 Cognitive Adverse Effects

ECT is associated with cognitive side effects, particularly during and shortly after treatment, including acute post-treatment confusion and both anterograde

amnesia, or difficulty forming new memories, and retrograde amnesia, or difficulty recalling past events. The majority of these cognitive impairments are temporary, with neuropsychological assessments showing resolution within days to weeks after treatment ends; cognitive impairment due to the underlying psychiatric disorder itself often improves as symptoms remit with ECT, and long-term studies have not found an increased risk of dementia among patients treated with ECT. Standardized cognitive assessments are routinely conducted before, during, and after ECT treatment to track changes in cognitive function over time.^[6]

1.5 ECT Technique and Procedure

A comprehensive pre-ECT evaluation is performed to ensure patient safety and optimize outcomes, including a detailed psychiatric assessment of previous treatment response; a complete medical examination focusing on cardiovascular, pulmonary, neurological, and musculoskeletal health; dental evaluation; review of anesthetic history; and cognitive screening to establish a baseline for post-treatment comparison. Commonly performed investigations include complete blood count, serum electrolytes and renal function tests, electrocardiography, and, when clinically indicated, neuroimaging or electroencephalography.^[5]

During the procedure, electrodes may be placed bilaterally, which is preferred for urgent cases; unilaterally on the right side, which is preferred when minimizing cognitive side effects; or bifrontally, as an alternative configuration. Brief-pulse or ultra-brief-pulse stimulus waveforms are used, with dosing adjusted empirically to elicit an adequate seizure, and effective therapeutic seizures typically last between 15 and 70 seconds on electroencephalographic monitoring. General anesthesia and a muscle relaxant are administered to prevent awareness and reduce the risk of seizure-related physical injury, with the patient receiving assisted ventilation throughout the procedure and monitored in a recovery area until fully alert, usually within 30 minutes.^[5]

Before each session, patients are typically advised to abstain from solid food for 6 to 8 hours and clear fluids for at least 2 hours, with bladder emptying recommended immediately before treatment to prevent discomfort. Key equipment required for ECT administration includes the ECT device itself, vital sign monitors, pulse oximetry, supplemental oxygen delivered via nasal cannula or face mask, a bag-valve-mask, a suction apparatus, a nerve stimulator, an electromyograph, and a blood pressure cuff.^[5]

1.6 Treatment Course

There is no universally fixed number of ECT sessions, as treatment duration is tailored to each patient's clinical status and therapeutic response. ECT is typically delivered two to three times per week during an acute treatment phase lasting two to four weeks, with most

patients requiring 6 to 12 sessions, although some respond after only 3 treatments while others may need 20 or more sessions for adequate clinical effect; in cases of severe psychiatric disturbance, such as high suicide risk or catatonia, ECT may be administered daily to achieve faster stabilization. Following the acute phase, some patients benefit from continuation or maintenance ECT, with sessions spaced 1 to 4 weeks apart, to prevent relapse and sustain clinical remission, particularly in patients with recurrent mood disorders or treatment-resistant conditions in whom pharmacological strategies alone are insufficient.^[5]

1.7 Rationale for the Study

Despite the well-documented efficacy and safety of ECT internationally, published data describing the pattern and outcomes of its use in Iraq, and specifically in Mosul City, remain scarce. Characterizing local practice patterns is essential for guiding clinical service planning and mental health policies.

1.8 Aim of the Study

This study aimed to determine the pattern of electroconvulsive therapy use among patients attending psychiatric consultations in Mosul City.

1.9 Specific Objectives

1. To analyze the demographic and clinical characteristics of patients who received ECT.
2. To assess the frequency and outcomes of ECT use among patients who attended psychiatric consultations.
3. To identify the clinical indications for which ECT is administered.
4. To provide evidence-based recommendations that highlight the need for better-equipped mental health services.

2. PATIENTS AND METHODS

Official administrative approval was obtained from the Scientific Council of the Arab Board of Health Specializations in Family and Community Medicine, Iraq, together with ethical approval from the Nineveh Health Directorate. Verbal consent was obtained from each participant after explaining the nature and objectives of the study.

This study was conducted at Ibn Senna Teaching Hospital (established in 1964, originally 500-600 beds) and Al-Salam Teaching Hospital (established in 1985, originally four hundred beds) in Mosul, Iraq, both of which currently operate with reduced bed capacities compared to their original establishment. Both are recognized training centers for the Arab Board and Iraqi Board of Medical Specializations and play a key role in psychiatric care and postgraduate clinical education.

2.1 Study Period

The study was conducted from February to July 2025, following ethical approval from the Nineveh Health Directorate. Data collection took place over the first five

months, with two to three visits per week to the psychiatric consultation units, and the final month was dedicated to data analysis and reporting.

2.2 Study Design, Population, and Sampling

This study adopted a descriptive cross-sectional design was adopted. The study population comprised 130 patients who received ECT in hospitals across Mosul City, referred based on approved clinical indications determined by the attending psychiatrists. A non-probability convenience sampling method was used, and data were collected using a structured, updated questionnaire designed to capture comprehensive clinical and sociodemographic information relevant to ECT.

Inclusion criteria: Patients who received ECT at the study hospitals during the study period.

Exclusion criteria: Patients diagnosed with a psychiatric disorder not requiring ECT and patients refusing to provide consent.

2.3 Data Collection Tool

A structured, updated questionnaire designed to capture comprehensive clinical and sociodemographic information relevant to the pattern of ECT use was administered. The tool comprised two main sections. Section A recorded sociodemographic data, namely age, sex, residence (urban/rural), occupation, level of education, and marital status. Section B recorded clinical and ECT-related information, namely the psychiatric diagnosis (e.g., major depressive disorder, bipolar disorder, or schizophrenia), the indication for ECT, the number of ECT sessions received, the frequency of ECT administration, whether ECT was effective, and any side effects experienced after ECT. Treatment effectiveness was assessed using the Clinical Global Impression-Improvement (CGI-I) scale, applied by the attending psychiatrists, with patients categorized as showing no, mild, moderate, or marked improvement based on post-treatment evaluation. Data were collected through direct interviews conducted with patients and their family members.

3. Statistical Analysis

Given the descriptive cross-sectional design of this study, data analysis was based on descriptive statistical methods, using Microsoft Excel to organize, code, and analyze the collected information. Frequencies and percentages were calculated for all sociodemographic and clinical variables, including age group, sex, socioeconomic status, psychiatric diagnosis, indication for ECT, number and frequency of sessions, level of clinical improvement, and reported adverse effects, and the results were presented in tabular form to summarize the characteristics of the study population and facilitate comparison across subgroups.

3.1 Socio-Economic Status Classification

Socio-economic status (SES) was calculated using a composite score: $SES = Education + Occupation + (House\ ownership \times 0.5) + (Car\ ownership \times 0.1) + (Age$

$- 20)/100$, with adjustment for retired, unemployed, or deceased patients.

Educational level was scored from 0 (illiterate) to 7 (PhD or equivalent), and occupation was scored across six categories; house and car ownership were each scored on a binary scale (0 or 1).^[7]

Patients were classified into three SES groups: Low (0-4.7), Middle (4.8-9.4), and High (9.5-14.05).

4. RESULTS

Over the course of the study, 130 patients seeking psychiatric consultation were recruited from Ibn Senna and Al-Salam Teaching Hospitals and subsequently received ECT. The study population was categorized into 10-year age intervals, starting from 10-19 years and extending to 60-69 years. As shown in Table 1, the largest proportion of patients belonged to the 20-29 age group (27.7%), followed by the 30-39 (25.4%) and 40-49 (23.1%) age groups, while the 10-19, 50-59, and 60-69 age groups accounted for 11.5%, 10.0%, and 2.3% of patients, respectively.

Table 1: Age Group Distribution among the Study Population (n=130).

Age Group (years)	No. of Patients	%
10-19	15	11.5
20-29	36	27.7
30-39	33	25.4
40-49	30	23.1
50-59	13	10.0
60-69	3	2.3

Among the 130 patients, 77 (59.2%) were male, and 53 (40.8%) were female, as illustrated in Figure 1.

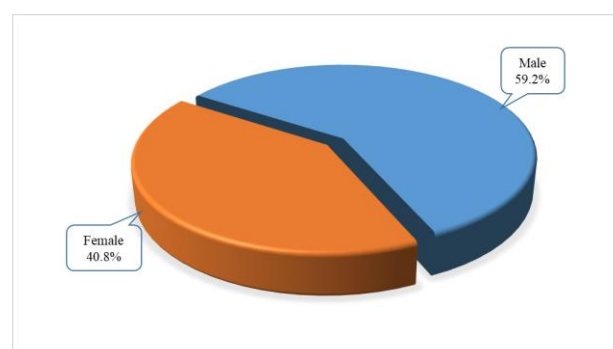


Figure 1: Distribution of the Study Population according to Gender.

According to the socio-economic status (SES) classification described above, the majority of patients (84.6%) were in the Low SES group, followed by the middle (9.2%) and high (6.2%) groups, as shown in Table 2.

Table 2: Socioeconomic Status Distribution among the Study Population.

SES Category	No. of Patients	%
Low	110	84.6
Middle	12	9.2
High	8	6.2

Among the 130 patients who received ECT, schizophrenia, including catatonic and dissociative forms, was the most frequent diagnosis (39.2%), followed by depression (26.2%), acute brief psychosis (20.0%), and bipolar disorder/mania (14.6%), highlighting the predominance of psychotic and affective disorders among ECT recipients in this study (Table 3).

Table 3: Distribution of Psychiatric Diagnoses among ECT Patients.

Diagnosis	No. of Patients	%
Schizophrenia	51	39.2
Depression	34	26.2
Acute brief psychosis	26	20.0
Bipolar disorder	19	14.6
Total	130	100

Gender-based analysis showed that schizophrenia was more common among males (64.7%), as were bipolar disorder (68.4%) and acute brief psychosis (57.7%), whereas depression showed a slight predominance among females (52.9%), suggesting gender-related variation in diagnostic patterns among ECT recipients, as shown in Table 4.

Table 4: Gender-Based Distribution of Psychiatric Diagnoses among ECT Patients.

Diagnosis	Male No. (%)	Female No. (%)
Schizophrenia	33 (64.7)	18 (35.3)
Depression	16 (47.1)	18 (52.9)
Bipolar disorder	13 (68.4)	6 (31.6)
Acute brief psychosis	15 (57.7)	11 (42.3)

Table 6: Distribution of Clinical Improvement by Number of ECT Sessions.

No. of ECT Sessions	No Improvement No. (%)	Mild No. (%)	Moderate No. (%)	Marked No. (%)
1-3 (n=7)	1 (14.3)	2 (28.6)	4 (57.1)	0 (0)
4-5 (n=39)	1 (2.6)	9 (23.1)	20 (51.3)	9 (23.1)
6-7 (n=83)	0 (0)	15 (18.1)	54 (65.1)	14 (16.9)
8-10 (n=1)	0 (0)	0 (0)	1 (100)	0 (0)

Table 7: Distribution of Clinical Improvement by Frequency of ECT Sessions per Week.

Frequency	No Improvement No. (%)	Mild No. (%)	Moderate No. (%)	Marked No. (%)
Once a week (n=4)	0 (0)	1 (25)	2 (50)	1 (25)
Twice a week (n=7)	0 (0)	1 (14.3)	5 (71.4)	1 (14.3)
Three times a week (n=92)	1 (1.1)	19 (20.7)	54 (58.7)	18 (19.6)
Four times a week (n=24)	1 (4.2)	4 (16.7)	16 (66.7)	3 (12.5)
More than four times (n=3)	0 (0)	2 (66.7)	1 (33.3)	0 (0)

The clinical indications for ECT administration were primarily treatment-resistant psychiatric disorders (67.7%), followed by severe psychiatric symptoms (26.9%), acute suicidal risk (4.6%), and catatonia (0.8%), as shown in Table 5.

Table 5: Clinical Indications for ECT Use.

Indication	No.	%
Medication resistance	88	67.7
Severe psychiatric symptoms	35	26.9
Suicidal risk	6	4.6
Catatonia	1	0.8
Total	130	100

Clinical improvement following ECT was analyzed across five session-number categories. Patients who received 4 to 5 sessions showed the most balanced outcomes, with 51.3% demonstrating moderate improvement and 23.1% experiencing marked improvement, while the 6 to 7 session group also showed high improvement rates (65.1% moderate and 16.9% marked). The single patient who received 8–10 sessions showed moderate improvement, whereas patients receiving only 1–3 sessions showed the lowest improvement rates, with 57.1% showing moderate improvement and 14.3% showing no improvement (Table 6).

Analysis by the frequency of ECT administration showed that patients treated three times weekly achieved the most favorable outcomes (58.7% moderate, 19.6% marked improvement), followed by twice-weekly (71.4% moderate, 14.3% marked) and four-times-weekly (66.7% moderate, 12.5% marked) schedules. Once-weekly sessions were associated with comparatively lower improvement, as shown in Table 7. Of the 130 patients who received ECT, 128 (98.5%) showed clinical improvement, while only two patients (1.5%), both with schizophrenia, did not exhibit a significant response, as shown in Table 8.

Table 8: Clinical Improvement Rate by Diagnosis.

Diagnosis	No. Improved	No. Unimproved	Improvement Rate %
Schizophrenia	49	2	96.1
Depression	34	0	100
Bipolar disorder	19	0	100
Acute brief psychosis	26	0	100

Patients with schizophrenia most commonly experienced moderate improvement (60.8%), followed by mild (29.4%) and marked (5.9%) improvements. In contrast, depression showed a higher proportion of marked improvement (38.2%), along with moderate (41.2%) and mild (20.6%) responses, while the bipolar disorder and acute brief psychosis groups also showed strong responses, with moderate improvement predominating (78.9% and 69.2%, respectively), as shown in Table 9.

Table 9: Levels of Clinical Improvement by Diagnosis.

Diagnosis	Mild %	Moderate %	Marked %
Schizophrenia	29.4	60.8	5.9
Depression	20.6	41.2	38.2
Bipolar disorder	10.5	78.9	10.5
Acute brief psychosis	11.5	69.2	19.2

Of the 130 patients, 35 (26.9%) had undergone previous ECT sessions, while 95 (73.1%) had no prior history. Among those with a history of previous ECT, 100% showed clinical improvement, while among first-time ECT patients, 97.9% improved, with only two patients (2.1%) not showing benefit, as shown in Table 10.

Table 10: Previous ECT history and overall improvement rate.

Previous ECT	No. of Patients	No. Improved	Improvement Rate %
Yes	35	35	100
No	95	93	97.9

The improvement intensity was similar between the groups: among patients without prior ECT, 60% experienced moderate, 22.1% mild, and 15.8% marked improvement, while among patients with prior ECT, 60% showed moderate, 17.1% mild, and 22.9% marked improvement, as shown in Table 11.

Table 11: Improvement Intensity by Previous ECT Exposure.

Previous ECT	Mild %	Moderate %	Marked %
Yes	17.1	60	22.9
No	22.1	60	15.8

Among the total sample of 130 patients, 30 (23.1%) reported experiencing one or more adverse effects, while the remaining 100 (76.9%) reported no side effects, as shown in Table 12.

Table 12: Distribution of Patients by Adverse Effect Presence.

Adverse Effect	No.	%
Absent	100	76.9
Present	30	23.1

The most frequently reported adverse effect was headache, documented in sixteen patients (12.3%), followed by combined confusion and transient memory loss (3.9%), isolated transient memory loss (3.1%), isolated confusion (1.5%), combined headache and confusion (1.5%), and combined headache and transient memory loss (0.8%), as shown in Table 13.

Table 13: Types and frequencies of adverse effects following ECT.

Adverse Effect	No.	%
Headache	16	12.3
Confusion & transient memory loss	5	3.9
Transient memory loss	4	3.1
Confusion	2	1.5
Headache & confusion	2	1.5
Headache & transient memory loss	1	0.8

Table 14 summarizes the key findings of this study in relation to its principal study parameters, providing a consolidated overview of the sociodemographic, clinical, and outcome data presented above.

Table 14: Summary of Key Study Findings.

Study Parameter	Key Finding
Gender distribution	Male 77 (59.2%); Female 53 (40.8%)
Predominant age group	20-29 years (27.7%)
Predominant socio-economic status	Low SES (84.6%)
Most common diagnosis	Schizophrenia (39.2%)
Most common indication for ECT	Medication resistance (67.7%)
Session range with most balanced improvement	4-7 sessions

Most favorable session frequency	Three times weekly (58.7% moderate, 19.6% marked)
Overall clinical improvement rate	128/130 patients (98.5%)
Diagnosis with greatest marked improvement	Depression (38.2%)
Improvement rate with previous ECT exposure	100% (35/35 patients)
Adverse effect prevalence	30/130 patients (23.1%)
Most common adverse effect	Headache (12.3%)

5. DISCUSSION

The predominance of low socio-economic status observed in this study is consistent with a South Korean report in which over 70% of ECT recipients were medical-aid beneficiaries^[10], supporting a broader trend of ECT utilization among poor populations in resource-limited psychiatric settings. This pattern may reflect the chronic and enduring nature of the psychiatric disorders most commonly treated with ECT, which are often associated with long-term functional and social impairment, reduced occupational capacity, and consequently, lower household income among affected patients and their families.

The predominance of schizophrenia among ECT recipients, together with the male preponderance in schizophrenia and bipolar disorder and the slight female preponderance in depression, is partially echoed by a Turkish study reporting higher rates of major depression among women and catatonia among men.^[11] Overall, the trend of mood disorders being more prevalent among females and psychotic disorders among males aligns with the findings of the present study. In contrast, a North Indian study of 70 ECT patients found a female predominance (55.7%) and a more evenly spread diagnostic distribution, comprising schizophrenia (35.7%), bipolar disorder (28.6%), and major depression (28.6%)^[12]; bipolar disorder was considerably more prevalent in that sample than in the present study (28.6% versus 14.6%), and the female predominance in ECT recipients differs from the male-dominated pattern observed here. These regional differences may be influenced by a range of factors, including referral practices, diagnostic criteria, and access to psychiatric care, underscoring the role of social norms and healthcare system structures in shaping diagnostic and gender-related trends in ECT practice.

Medication non-responsiveness and symptom severity were the leading indications for ECT in this study, consistent with a North Indian study in which treatment resistance was the primary indication for ECT in both depressive and manic/mixed bipolar episodes.^[13] This contrasts with a palliative-care study in which catatonia and psychiatric symptoms in terminal illness were the principal indications^[14], reflecting differences in treatment goals and clinical context between functionally stable and medically complex populations.

Clinical improvement increased with the number of ECT sessions received, consistent with findings from the CORE consortium, in which 54% of 253 adults treated for major depressive disorder achieved at least 50%

symptom reduction by session 3 and 65% achieved remission by session 10^[15], and with a Thai study of 46 schizophrenia patients receiving bilateral ECT, in which response rates rose progressively from 19.6% by session 3, to 37.0% by session 6, 43.5% by session 9, and 54.3% by session 12, reaching 60.9% by the end of treatment at a mean of 12.9 sessions^[16]; these findings reinforce the importance of continuing treatment for at least 8-12 sessions to optimize outcomes, mirroring the progressive response observed in the present study. Regarding session frequency, more frequent ECT schedules were associated with greater improvement in this study, in line with an Indian study reporting faster recovery with thrice-weekly ECT compared with lower-frequency regimens, albeit with a greater likelihood of cognitive side effects.^[17] However, a meta-analysis found no significant efficacy difference between twice- and thrice-weekly ECT^[18], suggesting that treatment schedules should be individualized according to diagnosis, severity, and patient tolerance and that variation across studies likely reflects methodological differences, sample diversity, and differing treatment protocols.

Response to ECT differed by diagnosis, with depression, bipolar disorder, and acute brief psychotic disorder showing higher rates of marked improvement than schizophrenia, which showed predominantly moderate improvement. This pattern is consistent with a Japanese study evaluating 17 patients with schizophrenia and 7 patients with mood disorders (major depressive disorder and bipolar disorder combined), in which both groups showed significant clinical gains following ECT, but the mood-disorder group showed greater improvement in positive, activation, and disorganization symptoms than the schizophrenia group, indicating a more pronounced therapeutic response in affective disorders.^[19] However, a systematic review by Zierhut et al. examining thirty-five studies of ECT's effects on negative symptoms in schizophrenia found considerable variation, with eight studies reporting no meaningful improvement and negative symptoms worsening among non-responders in two studies; where improvement was observed, it was generally modest compared with ECT's effects on positive or affective symptoms.^[20] This discrepancy may reflect methodological differences such as inconsistent treatment protocols, small sample sizes, or limited focus on symptom subtype, and suggests that ECT may be more effective for affective and positive psychotic features than for persistent negative symptoms, which are typically more treatment resistant. Patients with previous ECT exposure in the present study showed slightly better outcomes than ECT-naïve patients, consistent with a Scottish study in which a prior good

response predicted favorable outcomes in subsequent courses^[21], although another study reported that response is not consistently replicated across treatment courses^[22]; these discrepancies may be attributable to differences in patient selection, illness severity, or the interval between ECT courses, and patients with previous ECT exposure in the current study may also have benefited from greater familiarity with the procedure and improved treatment adherence.

Adverse effects were reported in approximately one-quarter of patients, most commonly headache, followed by transient memory loss and confusion, generally mild and self-limited. These rates were somewhat lower than those reported in the Royal College of Psychiatrists' ECT Accreditation Service National Report, which found headache rates of 20-30% and cognitive complaints in 10-20% of cases^[23], and lower than the headache prevalence of 26-85% reported during initial ECT sessions in another review^[24], possibly reflecting differences in procedural technique, sample composition, or under-recognition of transient symptoms in this setting. Importantly, none of the patients in this study reported effects suggestive of permanent structural or cognitive harm, consistent with the broader literature indicating that concerns about lasting brain damage from ECT have been disproven by numerous human and animal studies, and that cognitive effects, when present, are typically transient and resolve within days to weeks of treatment.^[6]

Taken together, these findings carry several clinical implications. The consistently high improvement rates observed for depression, bipolar disorder, and acute brief psychotic disorder support considering ECT as an effective option for these conditions when pharmacological treatment has failed, while the more variable response among schizophrenia patients suggests that treatment expectations and session planning should be adjusted according to diagnosis. The association between a greater number and frequency of sessions and improved outcomes further suggests that adequately resourced ECT services, capable of delivering an individualized number of sessions at a clinically appropriate frequency, are needed to maximize therapeutic benefit. The predominance of low socio-economic status among recipients also underscores the continued importance of ECT as an accessible treatment option in resource-limited psychiatric settings such as Mosul City, where pharmacological alternatives may be constrained by cost or availability.

This study has several strengths, including recruitment from two major psychiatric referral hospitals in Mosul City, which provided a reasonably comprehensive picture of ECT practice across diverse clinical indications, and the use of a structured questionnaire capturing both sociodemographic and detailed clinical data for each patient. However, several limitations of this study should be acknowledged. The cross-sectional,

descriptive design and non-probability convenience sampling limit the generalizability of the findings and preclude causal inferences regarding the factors associated with clinical improvement. Treatment response was assessed using the clinician-rated Clinical Global Impression-Improvement scale rather than a blinded or standardized symptom severity instrument, which may introduce observer-related variability. The study did not include long-term follow-up data to assess the durability of clinical improvement or the late-onset cognitive effects of ECT. Future prospective multicenter studies incorporating standardized outcome measures and longer follow-up periods are needed to confirm and extend these findings.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

1. Males formed the majority of the overall sample, especially among patients with schizophrenia, bipolar disorder, and acute brief psychotic disorder, whereas females were more common among depression cases, indicating possible sex-based differences in illness patterns.
2. Most patients belonged to low or middle socioeconomic classes, reflecting the continued accessibility and relevance of ECT in under-resourced populations.
3. ECT was mainly administered because patients did not respond to medication, with severe psychiatric symptoms being the second most frequent cause, demonstrating its essential use for challenging cases.
4. Schizophrenia was the most prevalent diagnosis among patients receiving ECT, highlighting its role in managing chronic psychotic disorders.
5. All patients with depression, bipolar disorder, and acute brief psychotic disorder achieved clinical improvement, with depression showing the highest rate of marked improvement.
6. Patients who received 6-7 ECT sessions demonstrated the highest rate of moderate improvement, while 4-5 sessions yielded the most balanced outcomes, including marked improvement, suggesting that a moderate session range of 4-7 sessions may be most beneficial.
7. Patients with previous ECT exposure showed slightly better outcomes, suggesting that repeated ECT courses may provide enhanced therapeutic benefits.

6.2 RECOMMENDATIONS

1. ECT should be maintained for schizophrenia, given its continued application and moderate improvement rates, while acknowledging that mood disorders may respond more favorably.
2. ECT should be considered a first-line intervention for treatment-resistant depression, bipolar disorder, and acute brief psychotic disorder, as these conditions showed the highest levels of clinical improvement in this study.
3. Encourage continuity of ECT in previously treated patients, as prior exposure is associated with slightly better outcomes.

4. Promote further controlled research to explore factors influencing differential responses to ECT, particularly in schizophrenia and across sex and socioeconomic subgroups.

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