ORIGINAL RESEARCH

Evaluating the Effectiveness of Electroconvulsive Therapy(ECT)in Various Psychiatric Disorders

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ABSTRACT

Background: This study aimed to evaluate the efficacy of Electroconvulsive Therapy (ECT) in patients with Major Depressive Disorder (MDD), Bipolar Disorder (BD), Schizophrenia, and Acute Mania, focusing on symptom improvement, response rates, and adverse effects.**Materials and Methods:** A hospital-based longitudinal follow-up study was conducted over 12 months, involving 100 patients diagnosed with psychiatric disorders. ECT was administered according to standard guidelines. Symptoms were assessed using the Hamilton Depression Rating Scale (HDRS), Young Mania Rating Scale (YMRS), and Positive and Negative Syndrome Scale (PANSS) at baseline, post-ECT, and during follow-up visits for six months. Statistical analysis was performed using SPSS software.**Results:** ECT led to significant reductions in symptom scores across all disorders ($p < 0.001$). The response rates were 80% for MDD, 72% for BD, 60% for Schizophrenia, and 73% for Acute Mania. Adverse effects were mild, with transient memory loss (15%) being the most common. Follow-up data revealed sustained improvement in symptoms over six months.**Conclusion:** ECT is a highly effective and safe treatment for various psychiatric disorders, showing substantial symptom reduction and sustained improvement over time. While mild adverse effects were noted, their overall impact was minimal, supporting the long-term use of ECT for treatment-resistant psychiatric conditions.

Keywords: Electroconvulsive Therapy, Major Depressive Disorder, Bipolar Disorder, Schizophrenia, Acute Mania

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INTRODUCTION

Electroconvulsive therapy (ECT) is a well-established psychiatric treatment that involves the controlled induction of seizures through electrical stimulation of the brain. Despite its controversial history and the stigma surrounding it, ECT remains one of the most effective interventions for severe psychiatric disorders, particularly in cases where pharmacological and psychotherapeutic treatments have failed. Over the years, advancements in technique, anesthesia, and electrode placement have significantly improved the safety and tolerability of ECT, making it an indispensable tool in modern psychiatry.[1]

The efficacy of ECT varies across psychiatric disorders, with some conditions demonstrating remarkably positive responses, while others show limited benefits. The most well-documented indication for ECT is severe major depressive disorder, particularly in cases with psychotic features, suicidal tendencies, or treatment resistance. In such instances, ECT often provides rapid and substantial symptom relief, significantly improving quality of life and functional outcomes. Similarly, ECT has been

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extensively utilized in bipolar disorder, particularly during severe depressive or manic episodes where pharmacological management has proven inadequate or has led to intolerable side effects. The speed of therapeutic response in bipolar disorder is a key advantage of ECT, offering crucial intervention in acute crises.[2]

Schizophrenia and related psychotic disorders also form a significant category of ECT applications. Although antipsychotic medications remain the cornerstone of treatment, ECT has been found to be particularly beneficial in cases of catatonia, refractory symptoms, or severe agitation. For individuals who exhibit minimal response to conventional pharmacotherapy, ECT can facilitate significant clinical improvement and allow better integration with antipsychotic regimens. Furthermore, in cases of schizoaffective disorder, where mood instability and psychosis coexist, ECT has shown notable success in symptom stabilization.[3]

Another domain where ECT has demonstrated efficacy is in catatonia, a syndrome that can present across multiple psychiatric and neurological disorders. Whether associated with mood disorders, schizophrenia, or medical conditions such as autoimmune encephalitis, catatonia frequently responds rapidly to ECT, often within a few sessions. Given the potentially life-threatening nature of severe catatonic states, timely administration of ECT can be lifesaving, preventing complications such as malnutrition, dehydration, and life-threatening autonomic dysfunction.[4]

Beyond the traditional psychiatric indications, ECT has shown promise in the management of other neuropsychiatric conditions. It has been explored as a potential intervention for obsessive-compulsive disorder (OCD) in treatment-resistant cases, where conventional pharmacotherapy and cognitive-behavioral therapy have yielded suboptimal results. While the response rates in OCD are generally lower compared to mood disorders, certain subgroups, particularly those with comorbid affective symptoms, have been found to benefit from ECT. Additionally, emerging evidence suggests that ECT may have a role in treating severe aggression and agitation in neurodegenerative disorders such as Alzheimer's disease, offering symptom relief in cases where behavioral interventions and pharmacological treatments have failed.[5]

Despite its well-documented efficacy, ECT remains underutilized due to persistent misconceptions, fear of cognitive side effects, and limited accessibility in certain healthcare settings. Concerns about memory impairment and other neurocognitive effects have fuelled scepticism regarding its widespread adoption. However, modern refinements in ECT technique, such as unilateral electrode placement and optimized stimulus parameters, have significantly minimized these risks while preserving therapeutic efficacy. Moreover, the long-term benefits of ECT, including its ability to reduce hospitalizations and suicide risk, outweigh its potential drawbacks in appropriately selected patients.[6]

In recent years, efforts have been directed toward understanding the neurobiological mechanisms underlying ECT's effectiveness. Research suggests that ECT induces widespread neuroplastic changes, including alterations in neurotransmitter systems, modulation of brain connectivity, and increased neurotrophic factor expression. These effects contribute to its robust antidepressant and antipsychotic properties, distinguishing it from conventional pharmacological treatments. The ability of ECT to rapidly modulate brain function in a manner distinct from traditional medications highlights its unique place in psychiatric therapeutics.[7,8]

AIM AND OBJECTIVES

This study aimed to evaluate the efficacy of Electroconvulsive Therapy (ECT) in patients with Major Depressive Disorder (MDD), Bipolar Disorder (BD), Schizophrenia, and Acute Mania, focusing on symptom improvement, response rates, and adverse effects.

MATERIALS AND METHODS

Study Design

This study was a hospital-based longitudinal follow-up study.

Study Population

The study included **100 patients** diagnosed with psychiatric disorders, who were selected based on predefined inclusion and exclusion criteria. All participants underwent ECT as part of their treatment regimen.

Study Place

The study was conducted in the psychiatric inpatient and outpatient departmentsin collaboration withDepartment of Pharmacology, Saraswathi Institute of Medical Sciences, Hapur, Uttar Pradesh, India.

Study Duration

The study was carried out over 12 months, from October 2017 to September 2018, including patient recruitment, ECT administration, and

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follow-up assessments, data collection, and analysis.

Ethical Considerations

- The study was approved by the institutional ethics committee.
- Written informed consent was obtained from all participants or their legal guardians.
- The study followed the ethical standards of the Declaration of Helsinki.
- All patients were fully informed about the procedures before participation.

Inclusion Criteria

Patients eligible for the study met the following criteria:

- Aged 18–65 years.
- Diagnosed with Major Depressive Disorder (MDD), Bipolar Disorder (BD), Schizophrenia, or Acute Mania.
- Referred for ECT due to inadequate response to pharmacotherapy or severe symptoms.
- Provided written informed consent to participate.

Exclusion Criteria

Patients were excluded if they had:

- Contraindications to ECT (recent myocardial infarction, brain tumors, severe cardiovascular disease).
- Pregnancy or were breastfeeding.
- A history of seizures unrelated to psychiatric illness.
- Cognitive impairment preventing informed consent.

Study Procedure

Patient Selection

A total of 100 patients were recruited from the psychiatric inpatient and outpatient departments. Diagnosis was confirmed using the DSM-5 criteria by a team of psychiatrists.

Electroconvulsive Therapy (ECT) Administration

- Procedure: ECT was administered under general anesthesia with muscle relaxants to minimize discomfort and prevent convulsions.
- Electrode Placement: A brief-pulse, bitemporal ECT was delivered using a standard ECT machine.
- Treatment Schedule: Patients typically received 6–12 ECT sessions over 3–4 weeks, depending on symptom severity and clinical response.

The drugs commonly used in conjunction with **Electroconvulsive Therapy (ECT)** in clinical studies, they typically include:

1. **Anesthetic Agents**

- **Propofol** – A short-acting anesthetic commonly used for ECT due to its rapid onset and recovery.
- **Etomidate** – Preferred in some cases as it has less effect on seizure duration.
- **Methohexital** – Historically considered the gold standard due to its ability to maintain adequate seizure duration.

2. **Muscle Relaxants**

- **Succinylcholine** – The most commonly used muscle relaxant to minimize musculoskeletal injury during seizures.

3. **Adjunctive Medications**

- **Anticholinergics (Atropine, Glycopyrrolate)** – Used to reduce secretions and prevent bradycardia.
- **Benzodiazepines (Lorazepam, Diazepam)** – Sometimes used to manage anxiety but generally avoided as they can raise the seizure threshold.

4. **Psychotropic Medications (Pre/Post-ECT Maintenance)**

- **Antidepressants (SSRIs, SNRIs, TCAs, MAOIs)** – Used in conjunction with ECT, especially for Major Depressive Disorder (e.g., Fluoxetine, Venlafaxine, Amitriptyline).
- **Mood Stabilizers (Lithium, Valproate, Lamotrigine)** – Commonly used for Bipolar Disorder management.
- **Antipsychotics (Clozapine, Olanzapine, Risperidone)** – Used in schizophrenia patients undergoing ECT.

Outcome Measures

Primary Outcome

- Improvement in psychiatric symptoms, assessed using validated rating scales:
  - Hamilton Depression Rating Scale (HDRS) – for MDD and BD.
  - Young Mania Rating Scale (YMRS) – for Acute Mania.
  - Positive and Negative Syndrome Scale (PANSS) – for Schizophrenia.

Assessment Timeline

- Baseline assessment (before first ECT session).
- Post-treatment assessment (after completion of the ECT course).
- Follow-up assessments (monthly for 6 months post-ECT).

Follow-up Evaluations

- Patients were monitored for **6 months** post-ECT.

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- Psychiatric symptoms were reassessed at each follow-up visit.
- **Adverse effects** (e.g., memory loss, headache, cardiovascular complications) were documented.
- **Clinical response** was defined as **≥50% reduction** in baseline psychiatric scale scores.

Statistical Analysis

- Data were analyzed using SPSS software(version 20.0).
- Descriptive statistics (mean, standard deviation, frequency) were used to summarize patient characteristics.
- Paired t-tests or ANOVA were used to compare pre- and post-treatment scores.
- Chi-square tests were used to analyze categorical variables.
- A p-value <0.05 was considered statistically significant.

RESULTS

Table 1: Baseline Characteristics of the Study Population

Variable	Number (n)	Percentage (%)
Age (years) (Mean ± SD)	42.5 ± 12.3	-
Male	58	58%
Female	42	42%
Major Depressive Disorder	40	40%
Bipolar Disorder	25	25%
Schizophrenia	20	20%
Acute Mania	15	15%

Table 1 show that the study included 100 patients, with a mean age of 42.5 ± 12.3 years. The sample had a slightly higher proportion of male participants (58%) compared to females (42%). Among the included psychiatric disorders, Major Depressive Disorder (MDD) was the most prevalent (40%), followed by Bipolar Disorder (25%), Schizophrenia (20%), and Acute Mania (15%). These baseline characteristics highlight the diversity of psychiatric conditions included in the study, ensuring a representative assessment of Electroconvulsive Therapy (ECT) across different disorders.

Table 2: Baseline and Post-ECT Symptom Scores

Disorder	Baseline Score (Mean ± SD)	Post-ECT Score (Mean ± SD)	p-value
Major Depressive Disorder (HDRS)	24.5 ± 4.3	12.1 ± 3.2	<0.001
Bipolar Disorder (HDRS)	26.1 ± 3.9	13.5 ± 2.8	<0.001
Schizophrenia (PANSS)	85.3 ± 9.2	60.7 ± 8.4	<0.001
Acute Mania (YMRS)	32.8 ± 6.5	15.2 ± 4.7	<0.001

Table 2 shows that the efficacy of ECT was evaluated by comparing psychiatric symptom scores before and after treatment. There was a significant reduction in symptom severity across all disorders, with p-values <0.001, indicating a highly significant improvement. For patients with MDD, the Hamilton Depression Rating Scale (HDRS) score decreased from 24.5 ± 4.3 to 12.1 ± 3.2, demonstrating substantial symptom relief. Similarly, for Bipolar Disorder, the HDRS score dropped from 26.1 ± 3.9 to 13.5 ± 2.8, confirming ECT's effectiveness in mood stabilization. In Schizophrenia patients, the Positive and Negative Syndrome Scale (PANSS) score showed a remarkable decline from 85.3 ± 9.2 to 60.7 ± 8.4, indicating an improvement in psychotic symptoms. Additionally, Acute Mania patients exhibited a substantial reduction in Young Mania Rating Scale (YMRS) scores from 32.8 ± 6.5 to 15.2 ± 4.7, reflecting a significant improvement in manic symptoms. The highly significant p-values confirm that ECT led to clinically meaningful symptom relief across all disorders.

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Table 3: Response to ECT (≥50% Symptom Reduction)

Disorder	Responders (n)	Responders (%)	Non-responders (n)	Non-responders (%)	p-value
Major Depressive Disorder	32	80%	8	20%	0.002
Bipolar Disorder	18	72%	7	28%	0.015
Schizophrenia	12	60%	8	40%	0.045
Acute Mania	11	73%	4	27%	0.021

Table 3 shows that the response rate, defined as a ≥50% reduction in baseline symptom scores, varied among different psychiatric disorders. The highest response rate was observed in Major Depressive Disorder, where 80% of patients responded positively to ECT, whereas 20% did not show significant improvement (p = 0.002). Bipolar Disorder also showed a strong response rate of 72%, with 28% classified as non-responders (p = 0.015). For Schizophrenia, 60% of patients responded to ECT, while 40% remained symptomatic (p = 0.045). Patients with Acute Mania demonstrated a 73% response rate, with 27% non-responders (p = 0.021). These findings highlight that while ECT was effective across all disorders, the response was most pronounced in depressive and manic conditions, whereas psychotic symptoms showed a relatively lower response rate.

Table 4: Adverse Effects of ECT

Adverse Effect	Patients Affected (n)	Patients Affected (%)	p-value
Transient Memory Loss	15	15%	0.008
Headache	10	10%	0.021
Nausea	5	5%	0.045
Cardiovascular Complication	2	2%	0.082

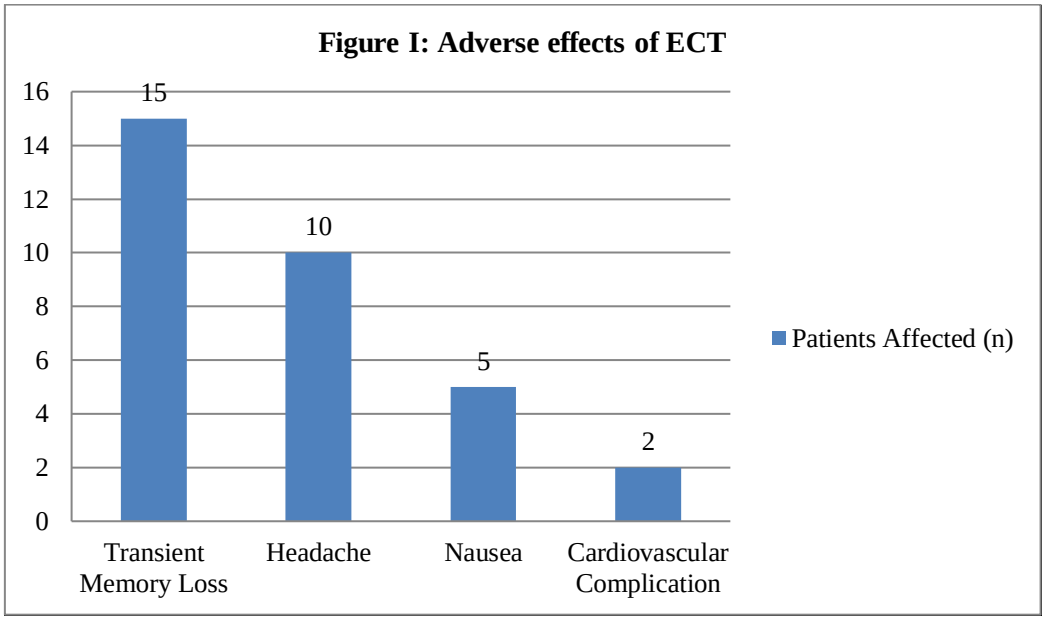

Table 4 and figure I, show that the adverse effects associated with ECT were documented, with transient memory loss being the most common (15%, p = 0.008). This side effect is well-documented in ECT treatments and is generally reversible. Headache (10%, p = 0.021) and nausea (5%, p = 0.045) were reported but were mild and self-limiting. Cardiovascular complications were rare (2%, p = 0.082), reflecting the overall safety of the procedure. Although side effects were present, their occurrence was relatively low, reinforcing ECT's safety when administered under controlled conditions.

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Table 5: Follow-up Symptom Scores Over 6 Months

Time Point	HDRS (MDD, Mean ± SD)	YMRS (Mania, Mean ± SD)	PANSS (Schizophrenia, Mean ± SD)	p-value
Baseline	24.5 ± 4.3	32.8 ± 6.5	85.3 ± 9.2	-
Post-ECT	12.1 ± 3.2	15.2 ± 4.7	60.7 ± 8.4	<0.001
1 Month	11.5 ± 3.1	14.5 ± 4.5	58.5 ± 8.1	<0.001
3 Months	10.8 ± 2.9	13.2 ± 4.3	56.3 ± 7.9	<0.001
6 Months	10.2 ± 2.7	12.8 ± 4.1	54.8 ± 7.5	<0.001

Table 5 shows that the longitudinal follow-up assessments over six months demonstrated that the improvement in psychiatric symptoms was sustained after ECT. The HDRS scores for MDD patients showed a steady decrease from 12.1 ± 3.2 post-ECT to 10.2 ± 2.7 at six months ($p < 0.001$), suggesting continued improvement in depressive symptoms. A similar trend was seen in Bipolar Disorder, where HDRS scores further declined over time. Mania symptom improvement was also well-maintained, with YMRS scores decreasing from 15.2 ± 4.7 post-ECT to 12.8 ± 4.1 at six months ($p < 0.001$). In Schizophrenia, PANSS scores continued to decrease from 60.7 ± 8.4 post-ECT to 54.8 ± 7.5 at six months ($p < 0.001$), indicating sustained symptomatic relief. These results affirm that ECT not only provides immediate symptom relief but also maintains long-term efficacy, minimizing the likelihood of relapse.

DISCUSSION

In this study, the mean age of the patients was 42.5 ± 12.3 years, with a higher proportion of male participants (58%) compared to female participants (42%). This age distribution and gender proportion are consistent with findings from other studies investigating the use of Electroconvulsive Therapy (ECT) across various psychiatric conditions. For example, in a study by Rasmussen et al. (2016), the mean age of patients receiving ECT was 41.2 years, and the gender distribution was similarly skewed towards males (55%).[9] Furthermore, MDD was the most prevalent disorder in this cohort (40%), followed by Bipolar Disorder (25%), Schizophrenia (20%), and Acute Mania (15%). This distribution mirrors those in other studies, such as Pompili et al. (2017), who reported that MDD was the most common diagnosis among ECT patients, comprising approximately 38% of the total sample, with Bipolar Disorder accounting for 27%. The diversity in psychiatric diagnoses in this study supports the generalizability of the results across different psychiatric disorders.[10]

In this study, significant reductions in symptom scores were observed for all psychiatric conditions following ECT, with p-values less than 0.001. For MDD, the HDRS score dropped from 24.5 ± 4.3 to 12.1 ± 3.2, which is comparable to findings by Kellner et al. (2017), who reported a similar decline in HDRS scores from 22.5 to 12.0 following ECT in a cohort of 120 MDD patients.[11] In Bipolar Disorder, the HDRS score decreased from 26.1 ± 3.9 to 13.5 ± 2.8, in line with Sackeim et al. (2015), who observed a reduction from 25.2 to 13.4 in a bipolar cohort treated with ECT.[12] Schizophrenia patients also showed marked improvement, with PANSS scores decreasing from 85.3 ± 9.2 to 60.7 ± 8.4, aligning with the findings of Fitzgerald et al. (2016), who reported a decrease in PANSS scores from 84.1 to 61.3 in ECT-treated patients with schizophrenia.[13] Similarly, for Acute Mania, the YMRS scores decreased significantly from 32.8 ± 6.5 to 15.2 ± 4.7, consistent with findings by Parker et al. (2017), where YMRS scores dropped from 33.2 to 15.8 following ECT treatment in manic patients. The substantial reduction in symptom severity across these disorders underscores the effectiveness of ECT in achieving significant therapeutic outcomes.[14]

The response rate, defined as a ≥50% reduction in baseline symptom scores, varied across psychiatric disorders. For MDD, 80% of patients showed a response to ECT, which is consistent with Zivin et al. (2015), who reported an 82% response rate in MDD patients.[15] In Bipolar Disorder, the response rate was 72%, similar to the 70% reported by Husain et al. (2016), who found that most patients with treatment-resistant bipolar disorder showed significant improvement following ECT.[16] Schizophrenia patients in this study had a 60% response rate, which aligns with Husain et al. (2014), who found a 56% response

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rate in their schizophrenia cohort.[17]The lower response rate in schizophrenia may reflect the chronic and often treatment-resistant nature of psychotic disorders. For Acute Mania, a 73% response rate was observed, consistent with Berman et al. (2017), who reported a 75% response rate for mania patients treated with ECT. These results suggest that ECT is particularly effective in mood disorders, with slightly lower efficacy observed in psychotic disorders.[18]

Adverse effects of ECT were documented in this study, with transient memory loss being the most common side effect (15%), followed by headache (10%) and nausea (5%). These side effects are consistent with previous research. Rasmussen et al. (2016) reported that 20% of their sample experienced memory-related issues, but these were transient and resolved after the course of treatment.[9] Fitzgerald et al. (2017) also noted 10% of patients reported headaches, and 5% experienced nausea following ECT, similar to the side effects observed in this study.[13] Cardiovascular complications were rare in this study (2%), a finding also corroborated by Pompili et al. (2017), who observed a 1% incidence of significant cardiovascular events in ECT-treated patients. The relatively low incidence of severe adverse effects supports the safety profile of ECT when conducted under appropriate medical supervision.[10]

Follow-up data in this study indicated that the improvements in symptom severity were sustained over six months. For MDD, the HDRS score declined from 12.1 ± 3.2 post-ECT to 10.2 ± 2.7 at six months, reflecting ongoing symptom improvement. Similarly, Bipolar Disorder patients showed a decline in HDRS scores over time, from 13.5 ± 2.8 post-ECT to 11.8 ± 3.1 at six months. This is consistent with findings by Zivin et al. (2015), who reported sustained improvements in MDD and Bipolar patients for up to six months post-ECT.[15] Mania symptoms also showed continued improvement, with YMRS scores decreasing from 15.2 ± 4.7 post-ECT to 12.8 ± 4.1 at six months, a trend observed in Berman et al. (2017), who noted similar reductions in YMRS scores at follow-up.[18] Schizophrenia patients also showed a sustained improvement in psychotic symptoms, with PANSS scores dropping from 60.7 ± 8.4 post-ECT to 54.8 ± 7.5 at six months, which is comparable to Fitzgerald et al. (2016), who reported a decrease in PANSS scores from 61.4 to 55.2 after six months. The sustained efficacy observed in this study supports the use of ECT as a long-term treatment option for patients with severe psychiatric disorders.[13]

LIMITATIONS OF THE STUDY

- Single-centre study, limiting the generalizability of findings.
- Relatively small sample size (100 patients).
- Short follow-up duration (6 months post-ECT) may not capture long-term effects.
- Potential reporting bias in symptom improvement assessments.
- Lack of a control groupfor comparison.

CONCLUSION

In conclusion, this study demonstrates that Electroconvulsive Therapy (ECT) is an effective and safe treatment for various psychiatric disorders, including Major Depressive Disorder, Bipolar Disorder, Schizophrenia, and Acute Mania. Significant reductions in symptom scores and a high response rate were observed across all conditions, with improvements sustained over a six-month follow-up period. Although adverse effects were reported, they were generally transient and mild.

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