# Explore the Demographic and Clinical Profile of Patients Receiving Electroconvulsive Therapy at tertiary care hospital in Oman: A Cluster Analysis

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## Abstract

**Objectives:** The study aimed to identify subgroups of psychiatric patients in a sample of patients admitted at a tertiary care hospital in Oman who received ECT based on their demographic and clinical outcomes.

**Methods:** Data from patients who received ECT at Al-Massarh hospital, Muscat, Oman, were retrospectively collected from medical records from January 2015 to December 2019. Socio-demographic characteristics, clinical profiles, and psychiatric comorbidities were examined.

**Result:** A summary of 179 psychiatric patients who received ECT, 96 (53.6%) are females, and the average age at diagnosis was 42.5 years. The 2-step cluster analysis showed 70 patients in Cluster 1 (39.1%) and 109 patients in Cluster 2 (60.9%). Patients in cluster 1 are more females (61.4%), older (Mean=55.2 years), majority were married (95.7%) and unemployed (88.6%). They reported they had comorbidities medical conditions (55.7%) and less frequent ECT use (Mean=8.7) than patients in Cluster 2. Clusters differences were found on gender (p=0.001), age (<.001), marital status

(p<.001), and occupation (p=0.001). In clinical outcomes, significant differences were found on diagnosis (p<.001), had comorbidity medical conditions (p<.001), and use of ECT sessions (p=0.006).

**Conclusion:** This study showed that psychiatric patients receiving ECT are heterogeneous, with different demographic and clinical outcomes. Our study has shown that patients in Cluster 1 are older females, unemployed, with more comorbidities in medical conditions and depressive disorders but received fewer ECT sessions. This study provides important information for clinicians to identify strategies to promote the use of ECT on its effectiveness and safety issues for each group.

**Keywords:** Electroconvulsive therapy; Schizophrenia; Cluster analysis; Oman

## Introduction

Electroconvulsive therapy (ECT) is a neuromodulative technique therapeutic processes in which seizure are induced by passing electrical stimulus to the brain(1)to provide improvement in a patient's mental state. Electroconvulsive therapy is an effective and safe treatment for a variety of psychiatric disorders, including mood disorders and schizophrenia .(2)Electroconvulsive therapy is performed in many countries worldwide and Several national surveys of ECT practice have been published over the past years .(3) ECT can achieve response rates of 50%–70% with treatment-resistant depression while standard antidepressant therapies achieve response with 16%–17% for such patients.(4) Recent data showed that among psychiatric inpatients, ECT is associated with a 46% lower risk of 30-day readmission compared with a matched group of patients with severe depression who did not receive ECT.(4) In a retrospective chart review during the period of 8 years in a tertiary psychiatric institution in Beijing, Patients who received ECT had a shorter length of hospitalization compared with the non-ECT group.(5) However, despite the effectiveness of ECT, but it considered in some country only after medications failed to treat psychiatric illness due to different attitudes towards the advantages and disadvantages of ECT .(6) A study conducted in the Netherlands found that 40% of psychiatrists did not have the correct knowledge about some technical details regarding ECT .(7) The practice of ECT, and utilization

rates vary among countries and regions within a country, which depend on several factors like, the prevalence of psychiatric illness, availability of service(8), number of trained doctors, awareness and concern about its efficacy and side effects .(9) The underutilization of ECT is thought to reflect a combination of factors, including, cultural beliefs, stigma(10), risk of cognitive side effects, and restricted access because of limited availability .(4) In Asia, a survey of 257 institutions in 23 countries suggested that the practice may be seen as suboptimal, schizophrenia was the main indication, unmodified ECT is commonly used, and no formal training was given .(11)

A meta-analysis about the use of electroconvulsive therapy (ECT) in 12 countries showed that patients in the western countries, who received ECT tended to be older women (12)and with depression.(13) In Norway, a study found that the male to female ratio in the usage of ECT was 1:2 .(14) It also noted that in western countries the main indications for ECT was depression like 78% Sweden(15), 70% Denmark (4)and 80.2% in Spain .(16) A retrospective study done on South Africa showed that the most common indication for ECT was depression, with most patients being between the ages of 18 and 59 years .(17) In contrast Asian countries where the patients tended to be younger men with schizophrenia .(13) The most majority of ECT patients had the age range of (24–44), were illiterate or had under school diploma education.(18)another study on the ECT practices in Iraq reported that the main indication for ECT was schizophrenia (51%), followed by severe depression (31.5%), resistant mania (10.4%) catatonia (2.4%) and others (4.4%).(16) According to the study was done in Thailand, patients with schizophrenia most frequently received ECT (74%), followed by mania (8%) and major depression (7%) .(15) As suggested that this difference in age group trends could be caused by Asian population demographics and the fact that schizophrenia (with higher prevalence in younger patients) is the main indication for ECT in Asian patients .(13) Previous studies have addressed the practice of ECT internationally but no local studies are available in Oman. The present study was conducted to identify subgroups of psychiatric patients who received ECT and to explore whether patients in the subgroups differed based on their demographic and clinical outcomes.

## Methodology:

### Study design, sitting and duration:

This is a retrospective cohort study that was conducted among psychiatric patients who admitted to the Al Massarah Hospital, Muscat, Oman and received ECT. We included all psychiatric patients, who aged 18 years and above and received ECT over the four years from January 2015 to December 2019. Patients who had no enough information were excluded from the study. The cohort of patients in this study was a mixture of different psychiatric diagnosis. In Oman, the healthcare system is characterized by being free with universal access for Oman citizens, and expatriates employed by Government. Al Massarah Hospital is a tertiary care facility, with full-fledged facilities in psychiatry with referrals from different regions of the country. Electroconvulsive therapy is mainly provided for inpatients in this hospital. The courses of ECT usually comprise six to twelve sessions for an adult under general anaesthesia, three times in the week, between 9:00 a.m. and 11:00 a.m.

### Demographic and clinical variables

The following variables were obtained from the hospital information system (ALSIFA 3 plus) using a data collection sheet. The medical records of each patient who underwent ECT were obtained using the following variables: age, gender, marital status (single, married and divorced), occupation status (employed, unemployed and student), and place of residency (rural and urban areas), the primary psychiatric Diagnosis were classified as (Schizophrenia, Bipolar affective disorder, schizoaffective disorder and major depressive disorder). The presence of medical comorbidities (yes or not). Also, we look at the Indication of ECT in this cohort of patients (Treatment resistance, Contraindication of antidepressants use, Catatonia and Immediate risk for suicide), the number of ECT sessions and whether the patient had previous ECT (Yes or No).

### Data analysis:

All the statistical analysis was carried out using IBM SPSS (IBM SPSS Statistics for Windows, Version 27.0 IBM Corp.). Descriptive statistics (e.g., mean, standard deviation [SD], median, range, frequency, percentage) were used to explore the demographic and clinical outcomes of the patients. The number of the subgroup was

identified by the 2-step cluster analysis. All demographic and clinical outcomes were used in the cluster analysis. The silhouette measure average was used to determine exactly how many subgroups were in this cohort (19). A silhouette value greater than 1 indicated that all samples are located directly on their cluster centers. Differences between clusters were evaluated using independent t-test and chi-square test/Fisher's exact test for numerical and nominal outcomes. All tests were set in 2-tailed and a $p<0.05$ was considered statistically significant.

**Ethical approval**

Ethics approval was granted by the Ministry of Health Research and Ethics Committee (MH/DGHS/DPT/536/2020). The study was conducted as per the Declaration of Helsinki and the American Psychological Association with regards to ethical human research, including confidentiality, privacy, and data management.

**Result**

**Demographic and clinical outcomes**

A summary of 179 psychiatric patients who received ECT is given in Table 1. Of all patients, 96 (53.6%) are females. The average age at diagnosis was 42.5 (SD 15.8) years, ranging from 16.0 to 88.0 years old. Almost half (50.3%) are single, 60% live in the urban area, and 75% are unemployed. The primary diagnosis of schizophrenia and schizoaffective disorder was 101 (56.4%) and 33 (18.4%), respectively. Of all patients, 60 (33.5%) had comorbidities medical conditions, 129 (72.1%) were treatment-resistant to ECT, 57 (31.8%) had received previous ECT treatment, and the average number of ECT sessions received was 9.7 (SD=3.7) times ranged from 1 to 18 times.

**Table 1. Demographic, and clinical outcomes of 179 patients received electroconvulsive therapy (ECT)**

| Outcome | n (%) |
|---|---|
| **Demographic** | |
| *Gender* | |
| Female | 96 (53.6) |
| Male | 83 (46.4) |
| *Age (years)* | |
| Mean±SD | 42.5±15.8 |

| | |
|---|---|
| Median [range] | 40.0 [16.0-88.0] |
| *Marital status* | |
| Single | 90 (50.3) |
| Married | 68 (38.0) |
| Divorced | 21 (11.7) |
| *Place of residence* | |
| Urban | 108 (60.3) |
| Rural | 71 (39.7) |
| *Occupation* | |
| Employed | 32 (17.9) |
| Student | 12 (6.7) |
| Unemployed | 135 (75.4) |
| **Clinical** | |
| *Primary diagnosis* | |
| Schizophrenia | 101 (56.4) |
| Bipolar affective disorder (BAD) | 25 (14.0) |
| Schizophrenia affective disorder | 33 (18.4) |
| Major depressive disorder | 20 (11.2) |
| *Comorbidities medical conditions* | |
| No | 119 (66.5) |
| Yes | 60 (33.5) |
| *Indication of ECT* | |
| Treatment resistant | 129 (72.1) |
| Catatonia | 11 (6.1) |
| History of previous good response to ECT | 18 (10.1) |
| Risk to others | 21 (11.7) |
| *Previous ECT treatment* | |
| Yes | 57 (31.8) |
| No | 122 (68.2) |
| *Number of ECT sessions received* | |
| Mean±SD | 9.7±3.7 |
| Median [range] | 10.0 [1.0-18.0] |

**Cluster analysis results**

The analysis produced two clusters as the best solution. When the cluster number was two, the silhouette measures were the largest, with 1.56. The 2-step cluster analysis showed 70 patients in Cluster 1 (39.1%) and 109 patients in Cluster 2 (60.9%). Both demographic and clinical profile of the clusters is presented in Table 2. Patients in cluster 1 are more females (n=43, 61.4%), older (Mean=55.2 years, SD=14.7), majority were married (n=67, 95.7%) and unemployed (n=62, 88.6%). They reported they had comorbidities medical conditions (n=39, 55.7%) and less frequent ECT use (Mean=8.7, SD=4.0) than patients in Cluster 2. Patients in cluster 2 are more males 63.3%, n=69), younger (Mean=32.5 years, SD=10.1), and majority are single (82.6%). They reported more are schizophrenia (n=79, 72.5%), no comorbidities medical conditions (n=88, 80.7%), and more frequently use of ECT (Mean=10.3, SD=3.5) than patients in cluster 1. Clusters differences were found on gender (p=0.001), age (<.001), marita7l status (p<.001), and occupation (p=0.001). In clinical outcomes, significant differences were found on diagnosis (p<.001), had comorbidity medical conditions (p<.001), and use of ECT sessions (p=0.006).

**Table 2.Comparison with demographic and clinical outcomes by clusters**

| | Cluster | | |
|---|---|---|---|
| | 1 (n=70, 39.1%) | 2 (n=109, 60.9%) | |
| **Outcome** | n (%) | n (%) | *p*-value |
| **Demographic** | | | |
| *Gender* | | | |
| Female | 43 (61.4) | 40 (36.7) | 0.001# |
| Male | 27 (38.6) | 69 (63.3) | |
| *Age (years)* | | | |
| Mean±SD | 55.2±14.7 | 32.5±10.1 | <.001^^ |
| Median [range] | 56.0 [19.0-88.0] | 34.0 [16.0-68.0] | |

| | | | |
|---|---|---|---|
| *Marital status* | | | |
| Single | 0 (0.0) | 90 (82.6) | <.001^ |
| Married | 67 (95.7) | 1 (0.9) | |
| Divorced | 3 (4.3) | 18 (16.5) | |
| *Place of residence* | | | |
| Urban | 36 (51.4) | 72 (66.1) | 0.051# |
| Rural | 34 (48.6) | 37 (33.9) | |
| *Occupation* | | | |
| Employed | 8 (11.4) | 24 (22.0) | 0.001^ |
| Student | 0 (0.0) | 12 (11.0) | |
| Unemployed | 62 (88.6) | 73 (67.0) | |
| **Clinical** | | | |
| *Primary diagnosis* | | | |
| Schizophrenia | 22 (31.4) | 79 (72.5) | <.001^ |
| Bipolar affective disorder (BAD) | 18 (25.7) | 7 (6.4) | |
| Schizophrenia affective disorder | 12 (17.1) | 21 (19.3) | |
| Major depressive disorder | 18 (25.7) | 2 (1.8) | |
| *Comorbidities medical conditions* | | | |
| No | 31 (44.3) | 88 (80.7) | <.001# |
| Yes | 39 (55.7) | 21 (19.3) | |
| *Indication of ECT* | | | |
| Treatment resistant | 47 (67.1) | 82 (75.2) | 0.534^ |
| Catatonia | 4 (5.7) | 7 (6.4) | |
| History of previous good response to ECT | 8 (11.4) | 10 (9.2) | |
| Risk to others | 11 (15.7) | 10 (9.2) | |
| *Previous ECT treatment* | | | |
| Yes | 24 (34.3) | 33 (30.3) | 0.574# |
| No | 46 (65.7) | 76 (69.7) | |
| *Number of ECT sessions received* | | | |
| Mean±SD | 8.7±4.0 | 10.3±3.5 | 0.006^^ |

| | | |
|---|---|---|
| Median [range] | 8.0 [1.0-18.0] | 12.0 [1.0-18.0] |

#, $\chi 2$ test; ^, Fisher's Exact test; ^^, independent t-test; ECT, Electroconvulsive therapy

**Discussion**

To our knowledge, this is the first study to examine the subgroups of psychiatric patients who received ECT in tertiary care hospitals in Oman and to explore whether patients in the subgroups differed based on their demographic and clinical outcomes. The findings in the present study indicate that these psychiatric patients who received ECT are not homogeneity in terms of their demographic and clinical profiles.

The study found that Cluster 1 was characterized with older females, and more are married and unemployed, with more comorbidities in medical conditions and depressive disorders but received fewer ECT sessions. The profiles of patients in cluster 1 keeping in line with similar results from different studies done in western countries like Norway and Spain, where the patients who received ECT tended to be older women (15,17,20). A patient's gender has no role in ECT treatment, but a study conducted by Schweder et al. shows that the male-female ratio receiving ECT was 1:2 (17)that is lower than our founding (1:1.6) in cluster 1. In terms of age, Nordenskjold et al. (2012) found the mean age of the patients receiving ECT was above 50 years, which is similar to the patients in cluster 1 (55.2 years)(18). In cluster 1, there are more than 51% of the patients who have a depressive disorder (25.7%) and BAD (25.7%), which is similar to a previous study done by Tor et al. (2019), shows that depressed female patients were more referred to ECT (21). The average number of ECT sessions delivered to patients in cluster 2 was 8.7 (±4.0), similar to previous studies in Asia. The average number of ECT sessions for patients with depressive disorder can take 6–9 treatments(7,8).

In contrast with cluster 1, patients in Cluster 2 were more young single men. The majority are schizophrenia and affective disorder, more without other comorbidities medical conditions, and receiving more ECT sessions. The mean age of our patients in cluster 2 was 32.5 years, and our finding posit what was found in other studies that done in the region, like Iraq and Iran with similar study tended to be younger men with schizophrenia (16,22). In this study, most of the patients in cluster 2 who had

ECT had a primary diagnosis of schizophrenia and Schizophrenia affective disorder (91.8%). In addition, more than 75% of them who underwent ECT is being treatment-resistant to medications. This finding similar to a study conducted in Iran and Iraq where the main indication for ECT was the resistant treatment of schizophrenia(16) . The average number of ECT sessions received for patients in Cluster 2 was 10.3 (±3.5), significantly higher than patients in cluster 1. However, our finding is similar to studies by Gonzalez-Pinto et al. (2002) and Krossler and Fogel (1993); they found that the number of ECT's given per patient was 9.7±3.7 and 11.0±3.1, respectively (23,24).There is high variability in the average number of ECT sessions delivered to patients ranging from 1 to 22 worldwide(14). This high variability is likely to result from differences in demographic and clinical profiles of the patients and may instead be related to differences in resources or practice. Why are more young male patients with schizophrenia received more ECT reported in Cluster 2? One likely explanation is a small budget for mental health care in Oman. As a result, we have limited alternatives in treating these patients. In addition, there are many more psychiatric beds for men than women also contribute to the predominance of male patients with schizophrenia receiving ECT in this sub-group.

**The implication in clinical practice**

Despite that fact, more antipsychotic and antidepressant drugs were used frequently in psychopharmacological treatment, which ECT will be used only after drug treatments failed (8,15,22) However, ECT is an effective and safe treatment for various psychiatric disorders, including mood disorders and schizophrenia**.** In Oman, future challenges to optimize the efficacy by using ECT include documenting the effectiveness and cognitive side effects of ECT and expanding the types of ECT available to different patient's profiles in terms of their demographic and clinical outcomes. A clinician should understand each subgroup's profile by establishing tailor-made consultation and help drive ECT development for different sub-groups. A study in Singapore shows that patients' quality of life with depression has been shown to improve after receiving ECT (21). In Oman, further research on ECT is recommended, especially regarding its effect on patients' quality of life in each sub-group.

**Limitations:** There are several limitations to our study. For example, we did not check the percentage of ECT per number of inpatients admitted in the target hospital, which

might give a general impression about the rate of ECT use per year. Few patients have ECT course more than once throughout our study from 2015 to 2019, which might affect with outcome somehow. Moreover, the present results only represent one hospital. Further study should expand to other hospitals to ensure the results are generalizability

**Conclusion**

This study showed that psychiatric patients receiving ECT are heterogeneous with different profiles on demographic and clinical outcomes. Our study has shown that patients in Cluster 1 are older females, more married and unemployed, with more comorbidities in medical conditions and depressive disorders but received fewer ECT sessions. However, patients in Cluster 2 were more young single men. The majority are schizophrenia and affective disorder, more without other comorbidities medical conditions, and receiving more ECT sessions. The findings may help address why previous research revealed that there are inclusive findings of psychiatric patients receiving ECT because the patients group are heterogeneous regarding their demographic and clinical outcomes. This study provides important information for clinicians to identify strategies to promote the use of ECT on its effectiveness and safety issues for each group. It also helps a clinician to understand each group's needs to help improve other psychological issues such as quality of life.

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**Availability of Data and Materials:** This is a research article, and all data generated or analyzed during this study are included in this published article.

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