



## Correlates of self-reported, autobiographical, and mini-mental status examination defined memory deficits following electroconvulsive therapy in South India



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### ABSTRACT

**Background:** Cognitive deficits, self-reported or found following electroconvulsive therapy (ECT), and their correlates are diverse. Despite the characteristics of people receiving ECT in Asia differ widely from the west, pertinent research from Asia remains sparse.

**Methods:** We investigated the correlates of self-reported, mini-mental status examination (MMSE) defined, and autobiographical memory deficits in a cohort that received ECT in a south Indian tertiary-care setting. 76 consecutive consenting people were recruited within seven days of completing their ECT course. Memory was assessed by a subjective Likert scale, MMSE, and an autobiographical memory scale (AMS). Psychopathology was assessed by brief psychiatric rating scale, and serum cortisol levels were estimated by chemi-luminescence immunoassays. Relevant sociodemographic and clinical data were collected from the participants, and their medical records. The correlates were analysed using generalised linear models after adjusting for the effects of potential confounders.

**Results:** Self-reported, MMSE-defined, and autobiographical memory deficits were present in 27.6% (95%CI 17.6–37.7%), 42.1% (95%CI 31.0–53.2%), and 36.8% (95%CI 26.0–47.7%) of participants, respectively. Agreement between the memory deficits was poor. Age, less education, duration of illness, hypothyroidism, and past history of another ECT course were significantly associated with MMSE-defined deficits. Age, anaemia, past ECT course, and pre-ECT blood pressure were significantly associated with autobiographical memory deficits, while residual psychopathology and cortisol levels were significantly associated with self-reported memory deficits.

**Conclusion:** Self-reported, MMSE-defined, and autobiographical memory deficits are common at the completion of ECT course, and their correlates differ. All service users receiving ECT need periodic cognitive assessments evaluating multiple cognitive domains.

### 1. Introduction

Assessment of memory deficits following electroconvulsive therapy (ECT) is complex. Firstly, cognitive deficits following ECT are not global, but discrete. Routine cognitive assessment instruments like mini-mental status examination (MMSE) may fail to elicit the deficits in specific domains such as autobiographical memory (Sackeim, 2014). Secondly, psychiatric disorders necessitating ECT *per se* can contribute to the cognitive deficits, and it is difficult to disentangle the effects of

the disorders and their treatment. Thirdly, opinions regarding ECT are often strong and polarised (Carney and Geddes, 2003). Many service users have reported severe enduring memory deficits following ECT (Chakrabarti et al., 2010; Rose et al., 2003). However, studies employing objective cognitive assessments have corroborated only acute and brief memory deficits (Semkovska and McLoughlin, 2010; UK-ECT-Review-Group, 2003; Versiani et al., 2011; Wang et al., 2015). The findings of service users-led and professionals-led assessments differ widely, and inherent observer bias is one of the potential explanations

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(Rose et al., 2003). Professionals tend to focus on laboratory evidence for brain damage and objective memory assessment findings (Fink, 2007). They may fail to address the distress and disability, reported by some service users (Rose et al., 2004). Studies evaluating self-reported and objective memory deficits in a cohort of service users that received ECT are sparse (Rajkumar et al., 2006).

Available studies have mostly evaluated the correlates of memory deficits, defined by standard cognitive assessments, following ECT (Andrade and Bolwig, 2014; McCall et al., 2000; Neylan et al., 2001; Sackeim et al., 2000; Shapira et al., 2000; Sobin et al., 1995). They have principally investigated the associations with many treatment-related variables, such as electrode placements, treatment schedules, electrical dosing, wave pattern, seizure duration, and anaesthesia. Bilateral ECT (UK-ECT-Review-Group, 2003), sine-waveform (Pisvejc et al., 1998), more frequent ECT schedules (Shapira et al., 2000), and higher supra-threshold electrical dosing (McCall et al., 2000) can increase the risk for memory deficits. Moreover, individual-related factors such as advancing age, female gender, and lower premorbid intelligence have been associated with memory deficits (Sackeim et al., 2007; Sobin et al., 1995). Higher cortisol levels have been reported to increase the risk for memory deficits following ECT (Neylan et al., 2001), and pertinent glucocorticoid mechanisms have been hypothesised (Nagaraja et al., 2007). A multifactorial model for the neurocognitive effects of ECT including various individual, illness, and treatment-related variables has been proposed recently (McClintock et al., 2014).

Systematic studies investigating the correlates of self-reported and autobiographical memory deficits remain sparse. Investigating the associations of these memory deficits with various individual, illness, and treatment-related variables may help to broaden our understanding of these deficits, to identify people at risk of developing these deficits, and to develop potential approaches minimising these memory deficits following ECT (McClintock et al., 2014). Besides, majority of service users receiving ECT are older women with depression in Europe and USA, but ECT is mostly used for younger men with schizophrenia in Asia (Leiknes et al., 2012). This limits the generalisability of the findings of western studies investigating ECT-related memory deficits to Asian settings, and relevant systematic studies from Asia remain few (Leiknes et al., 2012). Hence, we aimed to investigate the self-reported, MMSE-defined, and autobiographical memory deficits in a cohort that completed a course of ECT in a south Indian tertiary-care psychiatric facility.

## 2. Material and methods

### 2.1. Study design

We adopted a case-control design for investigating the study objectives.

### 2.2. Setting

The department of psychiatry, Christian Medical College (CMC), Vellore, India, is a tertiary psychiatric facility providing mental health services for service users from India. This 122-bed hospital has a daily outpatient clinic, and provides short-term inpatient care. Service users and their family members stay in independent cottages during the period of hospitalisation, which often ranges from four to eight weeks. The emphasis is on a multi-disciplinary approach using a wide variety of pharmacological and psychological therapies.

### 2.3. Practice of ECT

The department has a dedicated ECT suite, and follows twice weekly ECT schedule (Mondays and Thursdays). Bilateral fronto-temporal electrode placement is the norm, and all ECTs are completed under intravenous sodium thiopental (2–3 mg/kg) anaesthesia, and

intravenous suxamethonium chloride (0.5–1 mg/kg) muscle relaxation. Niviqure versatile ECT system (Niviqure Meditech Private Limited, Bengaluru, India) is used to deliver brief-pulse constant current electrical stimuli. A multi-disciplinary team including two psychiatrists, one anaesthetist, and 2–4 psychiatric nurses delivers all ECTs. Motor seizure duration is monitored using the “cuff” method (Chung, 2000). During the first ECT session of all service users, stimulus intensity is empirically titrated to elicit at least 25 s of motor seizures. This electrical dose is continued on subsequent sessions, except when there are specific indications to change the stimulus intensity. Following ECT, all service users are monitored in a recovery room within the ECT suite. Therapeutic decision on using ECT is made through consensus among the treating team. The treating psychiatrists explained the details of ECT, and its risks and benefits to the service users and to their family, and obtained written informed consent. The treating team decided the number of ECTs, ECT methods, and when to stop the ECT course. The authors did not influence any of these decisions.

### 2.4. Participants

All consecutive inpatients or outpatients, who were at least 18 years old, and completed or withdrew from a course of ECT in the department were invited to participate. All consenting eligible service users were recruited in this study. Service users with severe medical comorbidity, intellectual disability, sensory impairment, or severe psychopathology precluding the assessment were excluded. The nature and purpose of this study, involved procedures, expected duration of involvement, and potential risks and benefits of this study were explained to all participants and their nearest relatives, and written informed consent was obtained from all participants. The protocol of this study was approved by the institutional review board of CMC, Vellore, India.

### 2.5. Assessment

All participants were assessed by two independent investigators in two sessions within one week after completing or withdrawing from their ECT course. Each assessment session lasted for approximately forty-five minutes. One investigator assessed the service users' memory by the following, (i) A Likert scale: each service user subjectively rated his/her memory deficits following ECT on a six-point Likert scale. The responses included no, minimal, mild, moderate, severe, and extremely severe memory deficits; (ii) MMSE: It is a 30-item screening measure of general cognitive ability (Folstein et al., 1975). Its psychometric properties have been extensively studied (Lopez et al., 2005; Tombaugh and McIntyre, 1992); (iii) Autobiographical Memory Scale (AMS): Autobiographical memory was assessed by a culturally adapted 25-item AMS, which has already been used to investigate autobiographical memory deficits in an earlier cohort that received ECT in the department (Mohan et al., 2009). The AMS included major domains of a person's life, such as schooling, place of work, neighbourhood, and family events. Knowledgeable collateral source information from the next of kin was used as the criterion standard for evaluating the degree of recall of the participants (Dreyfus et al., 2010; Viswanath et al., 2013). Each AMS item was scored on a three-point scale from 0 (cannot remember anything) to 2 (can remember everything), and the total score of AMS ranged from 0 to 50.

Another independent investigator, blind to the results of memory assessment, assessed the psychopathology of all participants using 18-items Brief Psychiatric Rating Scale (BPRS). The BPRS is a short clinician-rated scale for measuring the severity of psychopathology, and it covers a broad range of areas including thought disturbance, emotional withdrawal, anxiety, depression, hostility, and suspiciousness (Overall and Gorham, 1962). The 18 items are rated from one to seven with a total score ranging from 18 to 126. The investigator interviewed all participants and their relatives using a structured proforma (Supplementary material) to collect data on individual-related variables

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