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Excessive screen time: An emerging concern in neurodevelopment and cognitive functioning

Exposure to different digital screens is common across different ages of an individual, and screen exposure is currently becoming universal. Mobile use is one of the main modalities of screen use from infancy to the elderly in recent times. The rapid expansion of digital technology has transformed childhood and adolescence in unprecedented ways. Smartphones, tablets, television, gaming platforms, and social media have become deeply integrated into everyday life. Screen use in children and adolescents can be started as a way of distraction by the parents to control tantrums, and in some cases, to start academic activities through online classes. However, these scenarios act as windows for further toxic screen exposures and gaming addictions. While digital media offers educational, social, and recreational opportunities, growing evidence suggests that excessive screen exposure may adversely influence neurodevelopment, cognition, emotional well-being, and physical health, particularly among children and adolescents whose brains are still undergoing active maturation.

Early childhood and adolescence represent sensitive developmental periods characterized by synaptic pruning, myelination, and maturation of executive networks. During these stages, environmental experiences significantly shape cognitive and behavioral outcomes. Excessive screen engagement may displace activities essential for healthy development, including face-to-face interaction, imaginative play, reading, physical activity, and restorative sleep. Such displacement effects are increasingly recognized as central pathways through which excessive digital exposure may influence developmental trajectories. Stimulation from the environment, in the critical period of the early years of brain development, is crucial for the progress of brain maturation. Increased screen exposure can lead to deprivation of stimulation in different domains of brain development. Deprivation of social and speech stimulation in early ages due to increased screen exposure can lead to a delay in neurodevelopment with a lag in social and communication domains, and autism symptoms. Screen use in adolescents is associated with anxiety, emotional symptoms, and aggressive behavior. Excessive screen time in adults and later ages also has negative effects, presenting as a decline in cognitive functioning.

Current literature consistently demonstrates associations between prolonged screen exposure and difficulties in language acquisition, attention, executive functioning, and academic performance.[1-5] Longitudinal pediatric studies have reported that higher screen exposure during early childhood is associated with poorer developmental outcomes in communication and problem-solving domains later in life.[2] Systematic reviews further suggest links between heavy screen use and reduced sustained attention, impaired working memory, and diminished classroom engagement.[3,4]

One proposed explanation involves the highly stimulating and reward-oriented design of digital platforms. Fast-paced audiovisual content, rapid reward cycles, and constant novelty may condition children toward shorter attention spans and lower tolerance for slower cognitive activities such as reading, reflective thinking, or classroom learning. Emerging neurobiological evidence has also identified possible alterations in brain regions associated with executive functioning, attention regulation, and emotional control.[6,7]

Recent neuroimaging studies using electroencephalography and functional magnetic resonance imaging have suggested structural and functional changes associated with excessive screen exposure.[6-8] Findings include reduced cortical thickness in regions related to language and executive functions, diminished frontal white matter integrity, and altered connectivity within the default mode and frontoparietal control networks. Some studies have also identified abnormalities involving frontostriatal and fronto-cingulate circuits, pathways frequently implicated in addictive behaviors.[7,9]

Alterations in neurotransmitter systems such as gamma-aminobutyric acid, glutamate, and dopamine have also been proposed.[7,8] Persistent stimulation of reward pathways through digital media may contribute to reduced intrinsic motivation for nondigital activities and greater vulnerability to compulsive patterns of media use. Although these findings remain preliminary, they offer biologically plausible mechanisms through which excessive digital exposure may influence cognition, impulse control, and emotional regulation.

The psychological consequences of excessive screen use have become an area of increasing concern. Several studies report associations between prolonged screen exposure and symptoms of anxiety, depression, behavioral dysregulation, attention-deficit/hyperactivity disorder (ADHD), emotional instability, and reduced psychological well-being.[4,10,11] Social media use may further intensify peer comparison, fear of exclusion, cyberbullying, and emotional reactivity among adolescents. Importantly, these relationships appear to be bidirectional in many instances; children with existing emotional or behavioral vulnerabilities may also be more likely to engage in excessive screen use.

Sleep disturbance is another important mediating factor.[4,12] Evening screen exposure, blue-light emission, irregular sleep routines, and nighttime social media engagement are associated with delayed sleep onset, reduced sleep duration, and impaired sleep quality. Poor sleep may subsequently impair memory consolidation, emotional regulation, attention, and executive functioning. In many children and adolescents, disrupted sleep may represent one of the strongest pathways linking excessive digital engagement to cognitive and mental health difficulties.

The physical health implications of prolonged screen exposure are equally significant.[1,4,13] Sedentary behaviors associated with excessive screen use contribute to reduced physical activity,

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obesity risk, visual strain, musculoskeletal complaints, and poorer cardiometabolic health. Excessive screen engagement may also reduce opportunities for outdoor play, social participation, and healthy lifestyle routines essential for overall development.

Despite growing concerns, the evidence should be interpreted with caution. Not all forms of screen use are equally harmful, and total duration alone may not adequately explain developmental outcomes. Some large-scale studies suggest that socioeconomic conditions, parenting styles, family environment, and pre-existing vulnerabilities substantially influence observed associations.[11,14] Educational, interactive, and developmentally appropriate digital content used with parental involvement may provide cognitive and social benefits, whereas passive, addictive, or socially isolating forms of media use appear more problematic.[2,11,14] Contemporary research increasingly supports a broader “digital ecology” perspective rather than a simplistic assumption that all screen time is inherently harmful. The quality of content, developmental stage of the child, context of use, emotional engagement, and degree of parental mediation are likely more important than screen duration alone.

WHAT IS WELL ESTABLISHED

- Excessive screen exposure is associated with sleep disturbance, reduced physical activity, obesity risk, and behavioral difficulties[1,4,13,15]
- Higher screen use during early childhood correlates with delays in language and cognitive development[2,3]
- Heavy digital media engagement is associated with attention problems, anxiety, depressive symptoms, and ADHD-related behaviors in adolescents[4,10,11]
- Sleep disruption is an important mediating mechanism underlying several cognitive and emotional consequences[4,12]
- Excessive engagement with reward-driven digital platforms may contribute to compromised cognitive control and increased impulsivity.

AREAS THAT REMAIN UNCERTAIN

- Whether screen exposure directly causes cognitive impairment or primarily reflects associated environmental and socioeconomic factors
- The exact neurobiological mechanisms responsible for observed structural and functional brain changes
- Whether educational and interactive content differs substantially in long-term effects compared with passive or addictive forms of media exposure
- The long-term neurodevelopmental consequences of emerging technologies such as AI-driven social media platforms, immersive gaming, and virtual environments
- The threshold and duration of screen exposure necessary to induce persistent neuroadaptive changes remain unclear.

There is also a need for research to differentiate effects according to content type, degree of interactivity, developmental stage, and sociocultural context. Standardized and objective tools for measuring digital exposure are required because most current studies rely heavily on self-reported screen duration. Advanced neuroimaging techniques may help clarify how prolonged screen engagement influences neural connectivity, executive networks, and reward pathways over time.[6,7,9]

Interventional studies evaluating digital hygiene practices, parental mediation, school-based regulations, and healthy technology habits are equally important.[1,12,13] Research from low- and middle-income countries deserves greater attention because family structures, educational systems, access to technology, and cultural practices differ substantially from those of high-income Western settings.

Excessive screen exposure has emerged as an important contemporary public health concern with potential implications for neurodevelopment, cognition, emotional well-being, and physical health. Although causality remains incompletely established, accumulating evidence indicates that excessive and poorly regulated digital engagement may adversely influence developing brains, particularly when it displaces sleep, physical activity, social interaction, and meaningful learning experiences.[1-4,13] The current goal should not be complete avoidance but the promotion of balanced, developmentally appropriate, and mindful technology use. A nuanced understanding that considers content quality, context of use, parental involvement, and individual vulnerability is essential for guiding families, educators, clinicians, and policymakers in the digital age.

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Pills for the perfectionist – Evidence for pharmacotherapy in obsessive–compulsive personality disorder: A review

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Abstract

Obsessive–compulsive personality disorder (OCPD) or anankastia is characterized by an excessive preoccupation with perfectionism, rigidity in thinking, and lack of openness. It is one of the most common personality disorders in the general population and shows a high degree of comorbidity with other psychiatric disorders. OCPD has a significant impact on patients' quality of life and contributes to a significant economic burden. However, research on OCPD and its treatment is rather limited. The aim of this review is to provide an overview of the available pharmacological treatment for OCPD and the evidence for its effectiveness. A literature search was conducted in PubMed and Google Scholar databases from their conception to date for English-language articles related to OCPD. The initial search strategy yielded 200 results, of which 53 were analyzed including original research, reviews, and case reports. All references and sources were cross-checked. There is no Food and Drug Administration (FDA)-approved medication for the treatment of OCPD. There is some preliminary evidence for the efficacy of fluvoxamine, citalopram, and carbamazepine in reducing OCPD symptoms. However, studies have used self-report measures that are poorly validated, are of small sample size, have no placebo arm, and lack follow-up data. Selective serotonin reuptake inhibitors (SSRIs) and psychotherapy continue to be the treatment of choice, albeit with little robust evidence. There is a need for well-planned and sufficiently powered randomized controlled trials that assess the efficacy of medications for individuals with OCPD. These should include patients with OCPD with and without comorbidities, use reliable instruments for assessment, and cover both academic and clinical settings.

Keywords: Anankastic personality, compulsive personality disorder, drug therapy, obsessive–compulsive personality

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INTRODUCTION

Obsessive–compulsive personality disorder (OCPD) as it is termed in the Diagnostic and Statistical Manual of Mental Disorders 5th Edition (DSM-5)[1] and Anankastic Personality Disorder in the International Classification of Diseases 10th Revision (ICD-10)[2] is characterized by "an excessive preoccupation with orderliness, mental and interpersonal control, and perfectionism at the expense of efficiency, openness and flexibility." Following the transition from the categorical to the dimensional model for Personality Disorders in the ICD-11, OCPD has found a place in the anankastia trait domain specifier for personality disorder (PD). As with PDs in general, OCPD starts in young adulthood, is consistent, and leads to marked personal distress and poor functioning. Despite OCPD showing a high level of psychiatric comorbidity, steep economic burden, psychosocial impairment, and poor quality of life,[3,4] it is a relatively underdiagnosed and poorly researched condition.[5,6] Most available evidence-based management strategies are focused on borderline and schizotypal PDs, with some information on treating avoidant and antisocial PDs.[7] Although patients with OCPD have better functioning than those with other PDs, the economic burden of the same remains high.[8] A Dutch study on the cost burden of PDs found that borderline PD (BPD) and OCPD, as compared to others, were significantly associated with bigger mean total expenditure, both medical and due to poor productivity.[9] This finding is ironically striking given the wealth of evidence-based treatments for BPD as opposed to those for OCPD. In a systematic review of randomized controlled trials (RCTs) on the

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use of pharmacologic treatments for people with PDs, it is noteworthy that no mention has been made of OCPD at all![10] For OCPD, no evidence-based treatment has been tested and proven using RCT. The FDA has not approved any medication for the treatment of OCPD, and while psychological therapies are used as the mainstay of treatment, the evidence for their efficacy is at best, mediocre.

AIM AND METHODOLOGY

The aim of this review is to provide an overview of the available pharmacological treatment for OCPD and the evidence for its effectiveness. We searched PubMed and Google Scholar databases from their conception to date for articles related to OCPD. We adopted a broad search strategy; the search terms are listed in Box 1. Boolean operators such as AND, NOT, and OR were used to refine and structure the search process for accurate outcomes. English was chosen as the preferred language. Two hundred articles were generated. Articles in languages other than English, those that dealt with psychotherapy for OCPD, and those focused on pure obsessive–compulsive disorder (OCD) were excluded. Fifty-three articles were chosen, including reviews, original research papers as well as case reports. All the references and sources were cross-checked.

PREVALENCE, CLINICAL FEATURES, ETIOLOGY, AND COMORBIDITIES

The criticism that the diagnostic validity of personality traits is diminished when they are considered categorical rather than dimensional has led to the completely dimensional model of PD in the ICD-11.[5,11,12] Although the DSM-5 has retained the categorical model, the ICD-11 anankastia domain aligns with DSM-5 OCPD traits, and factor analyses of the ICD-11 model lend further support to the domain's diagnostic validity.[13]

Epidemiological studies have found that Cluster C PDs (anankastic, anxious avoidant, and dependent) are rather prevalent in the general population and OCPD particularly so.[14] OCPD is known to affect about 2%–7% of the general population[15] and 23%–26% of those seeking medical help,[4] a finding that has been replicated across nations.[16,17] Studies assessing gender distribution have found varied results; some studies have demonstrated the same rates for men and women[18] whereas others have indicated higher prevalence rates among men.[16] OCPD seems to be more common in those with a high school education or less and less common in younger adults as well as those of Asian and Hispanic descent.[18]

Box 1: Description of the database search process

OCPD
or OCPD*
or anankastic personality disorder*
or anankastia*
or compulsive personality*
And treatment
or medications*
or psychotropics*
or drugs*
or therapy*
or management*
or pharmacotherapy*
Not OCD
or obsessive-compulsive disorder*
or OCD spectrum*

OCPD: Obsessive–compulsive personality disorder, OCD: Obsessive–compulsive disorder

People with OCPD/its traits demonstrate a preoccupation with order and details, perfectionism, excessive devotion to work, unshakeable morals and ethics, hoarding behavior, being miserly, unable to trust others with tasks, and having rigid ideas. They may also suffer from indecisiveness and procrastination, inability to accept change, being overinclusive with explanations, and being extremely critical of both self and others.[19]

Findings are inconsistent regarding the course and stability of OCPD. Several authors have shown that 38%–58% of patients no longer meet OCPD criteria within a 1–2 year follow-up period.[20,21] Others have demonstrated that OCPD remains stable or even worsens with age.[22,23] These differences may be explained by the fact that some OCPD criteria such as rigidity and hoarding may be more trait like and remain stable while others (miserliness and morality) may change in expression/severity as the person ages and/or due to the methodological differences between the studies.[21,24,25]

The available literature on etiology has also shown contradictory results. Psychological explanations have included a psychodynamic approach that targets parental dominance and overcontrol to attachment theories that blame insecure attachment and neglect during childhood to having led to OCPD traits in adulthood.[26] Biological theories support the heritability of the disorder, but data regarding the extent of impact of genes have been inconsistent.[4,27] A recent systematic review found impaired executive function and cognitive inflexibility in OCPD, akin to those with OCD. The authors reported the involvement of specific neurocircuitry in OCPD, chiefly the amygdala and the precuneus.[27]

While the level of comorbidity of PDs is high in general, OCPD was found to have the least co-occurrence with another PD.[28] In psychiatric inpatients, the highest elevated odds ratios were found for the comorbidity of OCPD with schizoid and paranoid PDs.[29] OCPD has been found to have fairly high rates of comorbidity with psychiatric conditions such as OCD (20%–32%), social phobia (21%) generalized anxiety disorder (16%), panic disorder (5%–11%), eating disorders (20%–61%),[18,28,30] mood disorders (31%), and substance use disorder (58%).[18] These are responsible for the comparatively high rate of help-seeking in those with OCPD,[31] mostly for individual psychotherapy on an outpatient basis or in primary health care settings.[32] The biggest debate has been about the overlap between OCPD and OCD, the argument being whether both are merely comorbidities or the same disorder in two different forms. However, most authors have opined that though very similar in various aspects, they are phenomenologically distinct constructs.[33] A systematic review of literature between 1991 and 2004 has revealed that at least 75% of those with OCD do not meet criteria for OCPD; likewise, 80% of those with OCPD do not have OCD. The authors concluded that while the two are inevitably linked, existing literature does not support either one as a mandatory or sufficient component of the other.[3]

TREATMENT OPTIONS

The mainstay of treatment for OCPD has been psychotherapy, as in the case of all PDs. However, the evidence for the same

in OCPD is nowhere as robust as in the case of the other PDs. Early clinical literature talks about the psychodynamic approach aimed at increasing patients' insight into how OCPD traits act as defenses against uncertainty and insecurity.[31,34] Several uncontrolled trials have hinted at the efficacy of cognitive therapeutic approaches.[35] Components of dialectical behavioral therapy have been tried; however, there are no RCTs that have proven its efficacy. Hence, although there is no empirically supported gold standard treatment for OCPD, psychotherapy continues to be recommended as the treatment of choice.[19]

A recent paper has suggested adapting the principles of good psychiatric management for managing OCPD.[32] These include: "Diagnostic disclosure, psychoeducation, getting a life, corrective experiences, managing comorbidities, multimodal treatment, suicidality management, and conservative pharmacological management." The authors have stressed that no single medication has been proven to be efficacious in OCPD and that medications are an aid to treat comorbidities, chiefly depression and anxiety rather than the PD itself and that, indirectly, this would give patients the stability to handle their OCPD symptoms during therapy.

EVIDENCE FOR PHARMACOTHERAPY

Despite the high prevalence of OCPD as well as its repercussions on the patients' quality of life as well as economic burden, the FDA has so far not approved any medication to treat OCPD. The ego-syntonic nature of the symptoms and continued fair occupational functioning will preclude the accessing of treatment by people with OCPD. Most patients come to clinical attention when they seek treatment for comorbid psychiatric disorders (e.g., anxiety disorders), other physical health conditions for which they are at risk (e.g., Cardiovascular disorders) or for interpersonal difficulties. Treatment may be disrupted by their persistence in disregarding the contribution of their personality to their difficulties.[36]

Among the psychotropic agents, the SSRI class of antidepressants has been routinely prescribed and the findings reported. The use of SSRIs in OCPD aligns with their use in OCD and related spectrum disorders.[37] Although phenomenologically, OCD and OCPD demonstrate clear differences, several individuals with OCD also receive a comorbid OCPD diagnosis.[38] Likewise, several people with OCPD demonstrate clinical features that resemble OCD. Further, significant impairments in executive planning and cognitive flexibility are seen in both groups of patients, hinting toward a common neurobiology.[39] Furthermore, when patients with OCPD have a comorbid depression, the clinician may naturally veer toward prescribing an SSRI. While theoretically these explanations make sense, studies that have actually tested the utility of SSRIs in OCPD are few and far between.

One of the earliest studies involved 46 outpatients with DSM-III major depression, of which 22 fulfilled criteria for a DSM-III compulsive personality and 24 exhibited only one compulsive feature. The patients received fluvoxamine (100–200 mg/day) for a period of 8 weeks and underwent assessments using the Hamilton Depression Rating Scale (HAM-D) at baseline, 2, 4, and 8 weeks of treatment.[40,41] Depressive symptoms improved significantly more in the compulsive group after 8 weeks, 29.4 (5.8) to 9.6 (5.1), as compared to 27.2 (3.4) to 15.9 (4.9) in the noncompulsive group ($F = 10.65$, df = 3,32, $P = 0.0001$). The findings imply that patients with depression and OCPD exhibit a "serotonergic depression." Other researchers who have analyzed the findings of this study have postulated that "the improvement shown in the patients with OCPD was due as much to the antidepressant treating the personality disturbance as to it treating the depressive one."[42]

In order to strengthen the results of their initial study, the authors recruited four male outpatients aged 34–51 years fulfilling DSM-IIIR criteria for OCPD and ruled out underlying depression using HAM-D.[43] These patients were started on 50 mg fluvoxamine which was later increased to 100 mg for 3 months and assessed every month. The mean total score of OCPD features improved, from an initial score (standard deviation) of 16.2 (2.9) to a final score of 11.7 (3.6) ($t = 7.0$, $P = 0.006$). The adverse effects were mild and predominantly related to the gastrointestinal system. The authors postulated that the results further reinforced the beneficial effects of SSRIs in patients with OCPD; however, they addressed caution in interpreting the results as it was an open study with a very small sample size.

There are studies using SSRIs that have been carried out on patients with OCPD with comorbid psychiatric conditions. A double-blind parallel group RCT on 308 patients with depression (out of which 71 patients also had comorbid OCPD) compared sertraline (50–150 mg/day) (n = 145) with citalopram (20–60 mg/day) (n = 163).[44] After 24 weeks of treatment, both medications showed a reduction in the dysfunctional personality traits. Citalopram was found to be more effective with fewer treatment dropouts. Depressive symptom improvement accounted for only 6% of the change in PD traits. However, the FDA advises cautious use of citalopram above 40 mg dosages due to the risk of QTc prolongation. While this is the biggest controlled study on medications in OCPD, it is fraught with uncertainties including a sample with a primary depression diagnosis, lack of a placebo arm, and inclusion based on self-report of OCPD traits.

The authors of the fluvoxamine trial conducted yet another study, with an improved design. It was a double-blind randomized placebo-controlled trial of 24 patients with a primary OCPD.[45] The patients were randomly prescribed fluvoxamine (50–100 mg/day) ($n = 12$) or placebo ($n = 12$). DSM-IV OCPD symptoms were evaluated using a Likert scale. OCPD reduced significantly more in the fluvoxamine group as compared to the placebo group. Three patients did not complete the study; the tolerability differences between the two groups were however not reported.

The studies mentioned have not given sufficient information to conduct a quality assessment or ascertain risk of bias; hence, later researchers have suggested that the results need to be interpreted with caution.[46]

A study that aimed to see whether OCPD in OCD may predict a poorer outcome to antiobsessive pro-serotonergic drugs analyzed 30 OCD patients divided into two groups, with and without OCPD. Oral antidepressants (SSRI fluvoxamine and tricyclic antidepressant

clomipramine) were prescribed for 10 weeks. The authors found that OCPD and the total number of PDs predicted poorer response to medications in OCD. These patients improved less with both treatments as compared to those with pure OCD.[47] The authors postulated that OCD with OCPD may be a subtype of OCD, warranting a different pharmacological approach.

Fluoxetine has shown promise in OCPD traits, though there are no studies assessing its efficacy in OCPD *per se*. Case reports have suggested that fluoxetine on dosages above 20 mg/day in adults reduces perfectionism and hoarding,[48] and that in children, doses of 10 mg/day reduce irritability and rigidity.[49]

Regarding other classes of psychotropic agents, reviews have reported about how the utility of antipsychotics and mood stabilizers in OCPD has been limited to isolated case reports and small open-label studies.[19]

There has been one case report on the use of carbamazepine in the management of OCPD.[50] A 61-year-old male with OCPD and OCD features was initiated on carbamazepine 100 mg bd, with improvement in irritability after 1 month. However, on increasing the dosage to 400 mg, his self-regulation improved further, but medication had to be discontinued due to a skin rash. Eight months later, his self-regulation had worsened.

A case-control study that assessed adult inpatients with psychiatric conditions compared those who had a comorbid OCPD (n = 52), other PDs (n = 56), and a well-adjusted personality (n = 53). Patients were on varied psychotropics based on the primary psychiatric condition and received treatment based on a 6–8-week mentalization-based therapeutic model. Those with OCPD were found to have higher rates of depression, anxiety, and emotional dysregulation. While they responded to the treatment given at a similar rate to the other inpatient controls, they continued to experience higher rates of anxiety even during discharge. The authors report a predominantly Caucasian and inpatient sample, self-report scales, and a nonmanualized treatment method as the limitations of the study.[51]

Hence, the sparse evidence available suggests that fluvoxamine and carbamazepine may assist in decreasing OCPD traits and that citalopram may be useful in comorbid OCPD and depression. To date, SSRIs continue to be the first choice of agents in clinical practice, possibly because of their utility in OCD which is very similar to OCPD and their favorable adverse effect profile. The most recent review on the topic concluded that there are no approved medications for OCPD and psychotherapy continues to be the first line of therapy, albeit with poor evidence.[52] The authors suggest research on therapeutic approaches that need to integrate a dimensional view of psychopathology with the latest neurobiological understanding such as the glutamate system and neuroinflammatory processes.

CONCLUSION AND FUTURE DIRECTIONS

PDs have been brought into the limelight with the ICD-11 opting for the dimensional model, making the diagnosis of PD a more meaningful and relevant exercise than previously. Nevertheless, the focus on certain PDs continues to be more at the detriment of the others. Several authors have argued that "with the exception of antisocial, borderline, and schizotypal PDs, research into PDs is either 'dead or dying'."[53]

OCPD is a relatively common condition both in the general population and in those seeking psychiatric treatment. However, evidence of management is limited to small studies with poor methodology, case reports, and anecdotal publications. It is obvious that for any PD, integrating psychopharmacology with the neurobiological effects of psychotherapy may give better and longer lasting results. The available evidence base for pharmacotherapy of OCPD has not been encouraging. There is some preliminary evidence of the usefulness and acceptability of citalopram, fluvoxamine, and carbamazepine in treating OCPD, but results are by no means certain. The available RCTs on medications for OCPD have relied on poorly validated instruments, self-reports of symptoms, comparatively less mean duration of treatment (12–24 weeks), and no follow-up data, thus disallowing robust conclusions about long-term efficacy and acceptability of psychotropics in OCPD.

There are several queries that are likely to puzzle the future optimistic researcher. One would be regarding which classificatory system to choose for diagnosis. Using ICD-11 and DSM-5 Alternative Model for PD may be more inclusive and allow assessment of whether anankastia and other dimensions respond differently to medications. Moreover, if SSRIs or other psychotropics are indeed an effective therapeutic tool for the management of OCPD, this would raise queries regarding the "medicalization of personality" and the related ethical aspects.

Since OCPD is a common malady with its fair share of impairment, personal distress, economic burden and a detrimental impact on the trajectory of comorbid conditions, there is a need for well-planned and sufficiently powered RCTs that assess pharmacotherapy for individuals with OCPD. These should include patients with both pure OCPD and with comorbidities, use reliable instruments for assessment, have a sufficiently large sample size, and cover both academic and clinical settings. Additional potential avenues for future research would include comparing different intervention modules and their combination and integrate the same with neurobiological changes leading to treatment outcomes.

OCPD is here to stay, and the scientific community owes it to the perfectionist to find some pills to make their lives less perfectionistic and consequently more fruitful.

Author contributions

SS conceived the research concept, defined the intellectual content, did the literature search, manuscript preparation and manuscript review. RN did the literature search, manuscript preparation, manuscript editing and manuscript review.

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Conflicts of interest

There are no conflicts of interest.

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Ophthalmic side effects of benzodiazepines: A narrative review of studies involving psychiatric patients

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Abstract

Benzodiazepines (BZDs) are commonly used for a range of psychiatric conditions; however, their ophthalmological adverse effects are frequently overlooked in clinical practice. This study reviewed the ocular adverse effects associated with BZDs, reported specifically from psychiatric settings. A literature search was conducted on PubMed and Google Scholar using the keywords "Benzodiazepines AND (Ocular side effects OR Ophthalmology side effects)," and articles that used BZDs for psychiatric indications were selected. We isolated 23 articles from our literature search. A wide range of ocular side effects of BZDs has been reported, including intraoperative floppy iris syndrome, blepharospasm, interruption of smooth-pursuit movement, glaucoma, visual field loss, and self-assessed visual deficit. Specific BZDs have limited literature on their ophthalmic side effects; reported ones include alprazolam and acute angle-closure glaucoma, lorazepam and reduced visual contrast sensitivity, clonazepam and toxic retinopathy, and diazepam and allergic conjunctivitis. Considering the impact on vision, these side effects can also be associated with psychological distress. All these highlight the need for caution in therapeutic practice. Considering the widespread use of BZDs in psychiatry, it is important to exercise caution while prescribing and to identify and monitor ocular side effects appropriately.

Keywords: Benzodiazepines, drug side effects, eye, ophthalmology, psychiatry

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INTRODUCTION

Benzodiazepines (BZDs) are used in a wide array of psychiatric presentations such as anxiety, panic attacks and disorders, insomnia, other sleep disorders, acute alcohol withdrawal, agitation, etc. In addition, they are used in muscle spasms, drug-induced dystonic reactions, seizure disorders, status epilepticus, and many other conditions. Their extensive use in both hospital and community settings is evident, with approximately 20% of patients having at least one BZD prescription.[1] BZD drugs are associated with a range of side effects, including those affecting the eyes and vision. However, there are hardly any studies or reviews related to the ophthalmological side effects of BZD, despite BZDs being frequently used for psychiatric indications. In this context, we intended to review the literature about the reported ophthalmological side effects of BZDs when used in psychiatric settings or indications. It is expected that the findings will increase clinicians' awareness of this often-overlooked issue in patient management and provide a rationale for further research to better understand the pathogenesis of ocular side effects.

It is known that BZDs act on multiple types of receptors in the central nervous system (CNS), primarily as positive, allosteric modulators on the gamma-aminobutyric acid (GABA)-A receptor. The clinical efficacy of BZD is partly attributed to the fact that GABA is the most common neurotransmitter in the CNS, with a high concentration of GABA-A receptors present in the cortex, limbic system, and retina.[2] GABA receptors present in the cortex are crucial to this functioning, particularly in neuronal firing, which, when impaired, can lead to hyperexcitable states such as seizures. In addition, these receptors are involved in regulating emotion, pain, and sleep.[3] The role of GABA within the limbic system is complicated and not yet fully elucidated. It is suggested that GABA-A receptor mediation in the limbic system is

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not exclusive to emotional behavior but affects the brain in its entirety. GABA-A receptor-mediated inhibition not only modulates several interictal and ictal discharges within the limbic areas but also can control the spread of neuronal activity, thus has a distinct role in the impedance of epileptiform discharges.[4]

Despite its peripheral location, the retina is a neural tissue within the CNS and plays a crucial role in visual processing through the process of phototransduction.[5] GABA receptors are present in certain layers and cells within the retina, hence identifying GABA neurotransmission in the retina.[6] The relationship between the effect of retinal function and BZD use is complicated but is thought to be mainly due to the interaction between amacrine and ganglion cells within the retina.[7] Therefore, due to the unwanted effects of BZDs, the sensitivity of the visual field is affected and can present as subsequent, perceived "visual loss."[8]

The intended therapeutic effect of BZDs is to produce a calming effect on the brain, owing to the inhibitory nature of GABA and its subsequent ability to reduce the excitability of neuronal activity. BZDs can exhibit rapid action owing to their lipid solubility, enabling them to diffuse through the blood-brain barrier quickly.[9]

Anxiety and insomnia are two of the most common indications for BZD therapy in psychiatry. While the clear pathophysiology is yet to be discovered, the mediators of anxiety in the CNS are thought to be due to a combination of neurotransmitters, namely GABA.[10] The amygdala in the limbic system has been demonstrated to contain a high concentration of GABA receptors, and it has also been recognized as an important mediator of anxiety.[11] The mechanism by which BZDs help alleviate anxiety has been proposed to be related to the allosteric modulation of the GABA-A receptor, resulting in an inhibitory, calming effect that can counter the hyperactive state in anxiety.[12]

Insomnia is defined as a persistent difficulty with sleep duration, consolidation, or quality occurring at least 3 days a week for a minimum of 1 month, despite suitable conditions for sleep.[13] Although the molecular mechanisms governing sleep remain incompletely understood, the balance between sleep-promoting and wake-promoting compounds is a commonly hypothesized factor. Among these compounds, GABA, along with cortisol, has been recognized as a key mediator in promoting sleep.[14]

The role and influence of GABA in patients with insomnia remains unclear. A study reported lower whole-brain GABA levels in insomnia patients compared to controls (Winkelman, 2008),[15] while another study reported contrasting findings that occipital GABA levels were higher in patients with primary insomnia.[16] The exact mechanism of action of BZDs resulting in therapeutic effects for insomnia remains unclear; however, it is likely to be due to their sedative effect, which can lead to unwanted drowsiness as a side effect. This sedative effect has been posited to be due to the action of GABA on the $\alpha 1$ subunit, which is present in 60% of all GABA-A receptors.[17] BZDs have been shown to increase sleep duration by 30–90 min, decrease sleep latency, and reduce the number of awakenings,[18] justifying their use in mitigating the effects of insomnia.

As per the British National Formulary (BNF) of the UK,[19] a common side effect of general BZDs is "vision disorders." There is no further expansion of what vision disorders are included in this definition, and hence, it is unclear. Beyond common side effects for the general BZD class of the BNF, there are no other listed side effects, including side effects of unknown frequency. Nystagmus with unknown frequency has been mentioned for clonazepam and diazepam. It appears the BNF lists limited ophthalmic side effects for BZDs, reflecting a relative scarcity of such reports in both clinical practice and the current literature.

However, commonly associated side effects of BZDs have been reported affecting a wide range of systems, such as gastrointestinal, respiratory, musculoskeletal, neurological, and ophthalmological.[20] Knowledge of the clinical side effects of medication is imperative to patient safety, allowing clinicians to safely discontinue or taper the medication dose.

Despite the diverse range of side effects, ophthalmological complications related to BZDs are reported less frequently in the literature.[21] To our knowledge, there is no comprehensive review of this topic in recent literature. Vision is often regarded as the most valuable sensory perception, with most people identifying it as the most valued sense in cross-sectional surveys,[22] and any medication-induced alterations in this precious sense are of paramount concern. Given the vital role sight plays in the quality of life, understanding and recognizing the potential ophthalmological side effects in patients prescribed BZDs are paramount. It may be especially important for psychiatric patients who may not often report their side effects, and it has to be proactively checked by the clinicians. In the above background, we intended to review the literature available on the side effects of BZD drugs as reported in psychiatric patients. It was expected that this information would be helpful for mental health professionals and psychiatric patients.

METHODOLOGY

Eligibility criteria

We included articles that described the side effects of BZDs used in patients with psychiatric illnesses, irrespective of the type of article. In our literature selection, we excluded articles describing BZD use in a stated or implied non-psychiatric setting or with patients without a psychiatric condition, articles describing non-ophthalmological side effects, side effects of psychiatric drugs different from BZDs, and articles looking at purely ocular measures, and not ophthalmic adverse effects.

Information sources and search strategy

We searched relevant articles in PubMed using the keywords "Benzodiazepines AND (Ocular side effects or Ophthalmology side effects)." The search included articles published up to 4th February 2024, in the English language or where an English translation of the article was available. There was no restriction implemented on publication type or publication date. We also searched Google Scholar to include articles published in non-indexed resources. In addition, cross-references of the selected articles were conducted.

Selection process

We considered articles reporting ophthalmic side effects associated with general BZDs as a class or specific BZDs as per the reporting

literature. Specific BZDs for which information was available included diazepam, lorazepam, clonazepam, and alprazolam.

Two reviewers assessed each study independently, and any ambiguities in the study selection were resolved by a consensus method involving all three authors. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines were followed in the process.[23]

Data items

The ophthalmological side effects included all reported ones, such as accommodation paresis, acute angle-closure glaucoma (AACG), allergic conjunctivitis, blepharospasm, diplopia, glaucoma, global loss of contrast sensitivity, impairment of saccadic smooth pursuit eye movement, intraoperative floppy iris syndrome (IFIS), mydriasis, nystagmus, reduced visual acuity, and visual field loss.

RESULTS

Study selection

The PubMed search yielded 134 total articles, with 15 articles isolated. Google Scholar produced a high volume of articles; the first 100 "most relevant" articles were considered using the search engine filter. We included the initial 100 articles to explore, presuming that most of the relevant results would be captured in the initial portions of the vast number of search results, and managing the volume of specific information on the topic. This resulted in 10 articles, 5 of which were distinct from the prior PubMed Search. This resulted in 20 total articles for this review. From this initial search, 3 additional references were manually included from articles, resulting in a final total of 23 articles, which were included in this narrative review.

A summary of the findings is provided in Table 1. Details of the side effects linked to BZD as a group and then by the individual BZD drugs are described below.

Ophthalmic side effects of benzodiazepine

The specific side effects of BZPs as reported while being prescribed for psychiatric indications are described below. As observed in this review, there are multiple clinical ophthalmic side effects reported; a summary version of the side effects is given in Table 2.

Acute angle-closure glaucoma

BZDs, by their muscle-relaxing properties that influence the dynamics of pupillary size, affect the sphincter pupillae muscle of the iris, which plays a pivotal role in regulating the iridocorneal angle. This muscle's relaxation can lead to the closure of the iridocorneal angle, potentially exacerbating an AACG episode. AACG represents an acute optic neuropathy arising from the rapid elevation of intraocular pressure due to the closure of the iridocorneal angle. The urgency in addressing AACG stems from its potential to induce blindness if not promptly managed.[24]

The theoretical association between BZD use and the risk of AACG has predominantly been established through case reports in review articles,[25] which, by their nature, may lack broader representativeness. Nevertheless, a case-crossover study conducted in 2020, involving an extensive cohort of over 11,000 South Korean patients, revealed a tangible link between BZD utilization and an escalated risk of AACG.[24] Notably, this study pinpointed diazepam and alprazolam as the most frequently prescribed BZDs exhibiting this trend. Conversely, long-acting BZDs like clonazepam, clobazam, and mexazolam did not demonstrate a heightened risk of AACG. However, it is crucial to acknowledge the limitations of these findings, as the research was specific to the South Korean population, rendering the generalizability of the results somewhat uncertain. In congruence with these findings, a study focusing again on the Korean population through a case-control approach underscored a significant risk of AACG within the initial 7 days of commencing BZD treatment.[26]

Intraoperative floppy iris syndrome

IFIS represents a well-documented complication inherent to cataract surgery, characterized by the outward displacement of the iris through the surgical incision wound. This condition presents a formidable challenge to cataract surgeons, potentially resulting in serious complications, including iris trauma and vitreous loss.[27] Historically, IFIS has been robustly associated with the administration of alpha-1 adrenoreceptor antagonists, such as tamsulosin.[28]

A prospective study involving 1,274 patients unveiled a noteworthy correlation between BZDs and the occurrence of IFIS.[29] Subsequently, this association was corroborated, although the study's cohort of BZD-using patients was comparatively modest.[30] Furthermore, a recent meta-analysis examining predisposing factors for IFIS underscored the significance of BZDs as a substantial risk factor.[31]

While the precise pathophysiological mechanism by which BZDs induce IFIS remains elusive, it has been postulated that their impact may be attributed to their influence on BZD receptors distributed within various ocular structures, including the iris.[32,33]

Blepharospasm

A correlation between the long-term utilization of BZDs and the manifestation of drug-induced blepharospasm, characterized by abnormal contractions of eyelid musculature, has been substantiated in prior research.[34,35] However, the precise etiological underpinnings remain unclear. Suzuki *et al*. have posited a particular pathogenesis, implicating BZDs in the induction of drug-induced blepharospasm by linking it to the activation of GABA receptors within the basal ganglia-cortical motor circuit, thereby inciting functional alterations.[36]

Deficit in visual function

The inadvisability of operating machinery or driving vehicles when under the influence of BZDs, whether combined with ethanol or taken alone, is widely accepted knowledge. This cautionary stance is not solely attributed to the sedative attributes of BZDs but also stems from their capacity to induce atypical saccadic,[37] and smooth-pursuit ocular movements, thereby disrupting the formation of a coherent retinal image and, consequently, impinging upon visual acuity.[38] Poorer self-assessed deficits in visual function have been documented in the literature with BZD use.[39]

Side effects of specific benzodiazepines

Alprazolam

One case report reports a 37-year-old male with alprazolam-induced bilateral AACG, which was identified and treated successfully with bilateral, peripheral iridotomy. This patient was not prescribed

Table 1: Articles included in the review and major findings

Type of article	BZD drug	Side effect(s)	Comments	Indications
Review[38]	Diazepam	Allergic conjunctivitis	Included information about a case report	Unspecified, but as part of psychiatric treatment
Review[25]	BZD	AACG	Studies linked AACG and BZD use	Depression Anxiety Insomnia
Review[32]	BZD	IFIS	Discussed the association of IFIS and BZD	Depression Anxiety Insomnia
Meta-analysis[31]	BZD	IFIS	Effect of BZDs predisposing to IFIS	Depression Anxiety Insomnia
Research[36]	BZD	Blepharospasm	Comparison of functional alterations between drug-induced and essential blepharospasm	Insomnia
Research[29]	BZD	IFIS	A prospective study concluded that BZD was independently associated with IFIS	Anxiety
Case series[42]	BZD	Nystagmus and reduced visual acuity	Association between nystagmus and benzodiazepine exposure in utero	Anxiety
Research[30]	BZD	IFIS	Benzodiazepine was found to be significantly associated with IFIS	Depression Anxiety Insomnia
Research[26]	BZD	AACG	BZD was associated with an increased risk of AACG	Depression Anxiety Insomnia
Research[39]	BZD	Visual perception affected	BZDs were associated with poorer self-assessed visual functions	Anxiety
Review[43]	Diazepam	Allergic conjunctivitis	National, interim report with limited literature on benzodiazepine and drug-induced ophthalmic side effects	Anxiety
Case report[21]	Lorazepam	Diplopia	First report of lorazepam-induced diplopia where discontinuation of lorazepam resulted in no diplopia	Obsessive-compulsive disorder
Case reports[40]	Clonazepam Alprazolam	AACG	First reports of bilateral AACG in the use of clonazepam and alprazolam	Anxiety, Insomnia
Case report[44]	Alprazolam	Mydriasis	First report of alprazolam-induced mydriasis	Anxiety
Case report[45]	Lorazepam	Accommodation paresis	First report of lorazepam-induced accommodation paresis	Depression
Review[46]	Diazepam	Allergic conjunctivitis	Review includes a case report regarding diazepam and associated allergic conjunctivitis	Unspecified indication, but as part of psychiatric treatment
	Lorazepam	Global loss of contrast sensitivity	Review includes previously mentioned case reports outlining the association of lorazepam and contrast sensitivity	Anxiety
Review[37]	BZD	Impairment of saccadic smooth pursuit eye movement	Included case reports to describe the ophthalmic adverse effect	Depression
	Diazepam	Acute glaucoma Allergic conjunctivitis Visual field loss		Absence seizure with unknown psychiatric indication Unspecified, but as part of psychiatric treatment Anxiety
Review[41]	Alprazolam	AACG, Mydriasis	Alprazolam is linked to a higher risk of bilateral AACG Included case report describing reversible mydriasis on discontinuation of alprazolam	Depression Anxiety
	Lorazepam	Diplopia	Case report from Lucca *et al*. to describe lorazepam-induced diplopia	Depression Anxiety
Review[47]	Diazepam	Glaucoma	Included a case report of glaucoma with diazepam	Absence seizure with unknown psychiatric indication
Case report[48]	Lorazepam	Diplopia	Diplopia secondary to lorazepam overdose	Major depressive disorder
Case report[49]	Diazepam	Allergic conjunctivitis	Conjunctival hypersensitivity during diazepam treatment, and self-limited once treatment had been discontinued	Unspecified, but as part of psychiatric treatment
Case report[50]	Diazepam	AACG	A case report describing a 54-year-old male who developed AACG once diazepam was started	Absence seizure with unknown psychiatric indication
Case report[7]	Diazepam	Visual field loss	Visual field deficit reverted on cessation of diazepam	Anxiety

AACG: Acute angle-closure glaucoma, BZD: Benzodiazepine group of drugs, IFIS: Intraoperative floppy iris syndrome

medications known to induce AACG and had no family history of glaucoma.[40,41]

Another case report identified a patient with alprazolam-induced mydriasis bilaterally. The patient had been taking alprazolam for

Table 2: Summary of ophthalmological side effects of the benzodiazepines

Drug	Adverse effects
BZDs	IFIS[29,31]
	Blepharospasm[34-36]
	Atypical saccadic and smooth pursuit movements[37]
	Self-assessed deficit in visual function[39]
	AACG[24-26]
Alprazolam	AACG[40]
	Mydriasis[44]
Lorazepam	Reduction in visual contrast sensitivity[46,51]
	Diplopia[21,48]
	Accommodation paresis[45]
Clonazepam	Toxic retinopathy[52]
	AACG[40]
Diazepam	Allergic conjunctivitis[38,43,46,49]
	AACG[50]
	Visual field loss[7]

AACG: Acute angle-closure glaucoma, IFIS: Intraoperative floppy iris syndrome, BZDs: Benzodiazepines

11 months, alongside escitalopram for anxiety. The patient was not taking any other medication and had negative toxicology. Ocular examination revealed dilated pupils of 6 mm in both eyes. After discontinuation of alprazolam for 2 weeks, the pupils had returned to 3 mm in size.[44]

Lorazepam

In a seminal study, a compelling discovery emerged, revealing a marked reduction in visual contrast sensitivity among individuals with a prolonged history of lorazepam use in comparison to their healthy counterparts.[51] Notably, this effect was not limited to long-term usage but extended to those employing lorazepam for shorter durations. Remarkably, this adverse influence on contrast sensitivity persisted despite comparable results in standard visual acuity assessments, underscoring the limited utility of such assessments in detecting additional visual deficiencies in patients on BZDs.

A case report has concluded that the near point of accommodation (NPA) was reduced while using lorazepam, and after cessation, the NPA had recovered by 6 cm in both eyes back to pre-intervention levels.[45] Another case report has been reported showing an intended overdose of lorazepam, inducing diplopia in a young lady who solely ingested large amounts of lorazepam with no history of prior diplopia or ophthalmic history. On cessation of lorazepam, her binocular diplopia gradually resolved over the next 24 h with no persistent neurological symptoms.[48]

The first report of lorazepam-induced diplopia was published in a 21-year-old male patient with no underlying ophthalmic or neurological disease. This was prescribed as a single dose of 4 mg of intravenous lorazepam; additional lorazepam was prescribed as required. Once the effects of the lorazepam had worn off, the diplopia had resolved with no recurrence.[21,41]

Clonazepam

Limited instances of BZDs inducing retinal toxicity have been documented, with two cases detailing mild retinal depigmentation on the bilateral posterior poles. These instances were observed in middle-aged women who presented with bilateral blurred vision and photophobia. Notably, both individuals were under extended clonazepam therapy, hinting at a potential association between prolonged clonazepam usage and the onset of toxic retinopathy.[52,53] It is important to highlight that in one of the cases, long-term clonazepam therapy was indicated due to epilepsy. Another case report has reported clonazepam-induced bilateral AACG in a patient with no noteworthy medication history, with a potential risk of AACG. The patient was successfully treated with bilateral, peripheral iridotomy.[40]

Diazepam

To date, a singular case report has documented a pure instance of allergic conjunctivitis attributed to the administration of diazepam.[38] A previous case report has linked allergic conjunctivitis to diazepam; however, the author of the report has suggested that this presentation of allergic conjunctivitis could have been attributed to contact lens irritation.[43,46,49] Another case report reported the association of diazepam and glaucoma, suggesting caution in prescribing BZDs in patients with glaucoma.[47,50]

Severe visual field loss has been reported to be linked with diazepam use, with cessation of the offending drug reversing this visual field loss. The case report described marked improvement in visual field recovery using the Humphry automated field testing just by stopping diazepam.[7]

DISCUSSION

This review highlighted the ophthalmic side effects of BZD, especially the observations in a psychiatric setting. The use of BZDs is massive in psychiatry, and it shows a consistent upward trajectory. In addition, BZD use in other departments and the general population is extremely common; for instance, a comprehensive cross-sectional analysis unveiled that over 10% of the United States population used BZDs as prescribed.[54] These make it a pertinent area for attention by the clinicians.

It was observed that a range of ophthalmic side effects have been reported with BZDs in psychiatric settings. Most of them have the potential to cause long-term vision impairment and are of concern. It is crucial to acknowledge that BZD utilization is most pronounced among the older adult population.[55] Older patients, owing to their age-related vulnerability, are at a heightened risk of developing ophthalmic side effects, e.g. AACG, an ocular side effect that is closely associated with BZD administration. This risk underscores the necessity for a vigilant approach to monitor potential occurrences of BZD-induced glaucoma in this population.

Ocular side effects not only impair visual acuity but also affect the functioning and have profound psychological repercussions on patients.[56] A noteworthy relation has been established between diminished vision and an increased susceptibility to suicidal ideation, a concern that is specifically prominent among the older age population.[57] Understandably, visual impairments can add further stress to the patients.

Possibly, the ophthalmic side effects are not given adequate attention in clinical practice. There is a need to increase clinician awareness on the subject, inform patients and their caregivers, limit BZDs use to essential duration, and monitor any ophthalmic side effects while BZDs are prescribed.

Limitations

A major drawback of this review is the use of only two electronic databases (PubMed and Google Scholar). Although it was coupled with the specific literature search from the cross references, there may be other appropriate articles in other databases. The literature covered a few commonly used BZDs rather than all of them. Overall, it appeared there was inadequate literature available in this area, considering the massive use of BZDs in psychiatric practice. It needs to be highlighted that most available evidence is based on case reports or small series, and that causality remains unestablished in many cases. Studies reporting an association do not establish causality linking BZD with the reported side effects.

CONCLUSION

This study highlighted various BZD-induced ocular side effects in psychiatric patients. Given the increasing use of BZDs worldwide, it is critical to understand the possible effects on eye health. It appears these issues are frequently overlooked in clinical practice. Inconsistencies between clinical recommendations like the BNF and documented ocular side effects in the literature emphasize this lack of clinical awareness. In addition, the scarcity of research on the adverse effects of BZDs on ocular health is minuscule, considering the widespread use of these drugs. The frequency of reported ocular side effects, which are mostly published in the form of single case reports, highlights the necessity of conducting extensive studies to determine the occurrence of these side effects in a wider range of patient groups. The practical clinical applications of the study findings include checking for any ophthalmic symptoms such as redness, pain, diplopia, decreased visual acuity, halos around lights, nystagmus, intense headache, nausea, and vomiting in patients after starting BZD. Specific inquiries are helpful as these symptoms may not be considered to be associated with BZD.

Vigilant monitoring and tailored therapeutic interventions for BZD-related ocular complications are essential to ensure the holistic well-being of patients, particularly among older and more vulnerable cohorts, where side effect reporting may be less frequent. In order to improve the understanding of these side effects and to inform the development of new recommendations that will assist doctors in better managing these issues, further research efforts are needed to clarify the occurrence and underlying mechanisms of BZD-induced ocular side effects.

Author Contributions

Nikhil Sharma: Concept, Literature Search, Review, write up, final approval of the version; Rahul Rana: Concept Literature Search, Review, write up, final approval of the version; Nilamadhab Kar: Concept, Literature Search, Review, write up, final approval of the version.

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Conflicts of interest

There are no conflicts of interest.

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Original Article

Exploring latent classes of adverse childhood experiences and their impact on mental health outcomes among female college students: A structural equation modeling approach

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Abstract

Context: Adverse childhood experiences (ACEs) are found to be a major public health concern causing physical, psychological, and emotional harm. Studies show that exposure to a single ACE has the likelihood of causing major negative outcomes, while exposure to four or more ACEs causes greater negative consequences during adulthood.

Aims: To explore the different class structures of ACEs and their association with sociodemographic factors, resilience, and psychological distress among female college students using latent class analysis (LCA) and structural equation modeling (SEM) approach.

Settings and Design: The current study adopted a quantitative approach with a non-probability judgment sampling (n = 387).

Subjects and Methods: A descriptive empirical method was used with an ex post facto research design.

Statistical Analysis Used: The study used LCA and SEM analysis to substantiate the objectives of the study.

Results: From the results, four classes being moderate childhood trauma (Class 1), mild childhood trauma (Class 2), severe childhood trauma (Class 3), and no childhood trauma (Class 4) were identified which were labeled on the basis of the probability composition of the different early life adversities. Depression (F = 7.69, P < 0.001), anxiety (F = 13.18, P < 0.001), and stress (F = 8.90, P < 0.001) were found to significantly vary across the classes, with severe childhood trauma participants having the highest level of psychological distress, and lowest level was found among the no childhood trauma participants.

Conclusions: The study has identified four distinct latent classes with ACEs, each showing differences in the probability of the various demographic characteristics as well as psychological distress. Thus, clinicians can tailor interventions targeting specific trauma profiles.

Keywords: Adverse childhood experience, childhood trauma, latent class analysis, psychological distress, structural equation modeling (SEM)

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INTRODUCTION

Adverse childhood experiences (ACEs) have become a major public health concern, causing increased mortality, morbidity, and a decline in quality of life during adulthood.[1] ACEs are defined as stressful, disturbing, negative occurrences that people may have undergone early in life, generally before they become 18 years of age. ACEs can cause severe harm to a child's physical and psychological health and have a lifelong negative impact on the overall well-being and relationships in their adulthood as well.[2] ACEs include a wide range of challenging early-life incidents determined as traumatic events such as abuse, which can be sexual, physical, and emotional abuse or in the form of long-lasting chronic stressors.[3] It is known that 19% of the global population of children reside within the geographic grounds of India, which corresponds to an overall Indian population of 42%, and from this population, almost half are vulnerable and are found to be in need of support, attention, as well as protection.[4]

Many studies state that the exposure to a single ACE has the likelihood of causing major negative outcomes during adulthood,

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with exposure to 4 or more than 4 ACEs prior to 18 years of age causing a higher risk of adverse consequences during adulthood.[5] India has seen a 96% increase in child sexual abuse, with 162,000 incidents recorded in 2022.[6] In reference to Tamil Nadu, 4338 crimes were reported against children in 2020, representing 3% of the crimes in India.[7] However, studies also highlighted that not all children exposed to adversities express concerns in the later periods of life, with the impact being buffered by various other factors.[8] This, therein, highlights the extent and complex nature of adversities that the children in Tamil Nadu have been exposed to, but the literature in this area is limited.

The current study aims to identify the classes with similar patterns of ACEs and to examine their association with psychosocial well-being among female college students. The purpose of the study is to (i) find patterns between ACE classes and the demographic characteristics (birth order, socioeconomic status, family dynamics) of the female college students; (ii) understand the patterns of ACE classes and their relationship with psychological distress among female college students; and (iii) understand the mediating role of socioeconomic status and resilience between the link of ACEs and psychological distress.

SUBJECTS AND METHODS

The current structure shows ACEs as the independent variable, socioeconomic status,[9] and resilience as the mediating variables, and depression, anxiety and stress as the dependent variables.

Participants and procedure

The current study adopted a descriptive empirical method with an ex post facto research design. The study obtained ethical approval from the institutional human ethics committee for student research (CARE IHEC– I). A non-probability judgment sampling method (n = 387) was used. The respondents were between 18 and 25 years of age. The data were collected from different colleges in Chennai using the ACEs—International Questionnaire, Depression Anxiety Stress Scale (DASS 21), and Brief Resilience Scale. The raw data were collected by providing hardcopies of the questionnaires to the students.

Instruments

Adverse childhood experiences

The presence of any form of adversity in the first 18 years of one’s life can be measured using a self-report ACEs—International Questionnaire.[10] With 42 items, which are used internationally with people who are aged above 18 years, it covers 13 adversities related to childhood abuse and neglect, household dysfunction, and community violence. Each question had one of the three response options, which are either (1) “yes” or “no.” (2) a 4-point Likert scale ranging from “Never” to “Many times,” as well as (3) a Likert scale with 5-points ranging from “Never” to “Always.” The entire scale has shown good internal consistency with Cronbach alpha value of 0.80.

Depression Anxiety Stress Scale-21

The DASS is a 21-item self-report scale that was found by Lovibond and Lovibond in 1995 and is used to assess the psychological distress level in individuals. The scale is divided into three subscales: depression, anxiety, and stress. The participants responded to the items through a 4-point Likert scale from 0 (“it never happened to me”) to 3 (“it always happens to me”). The scores of the scale lie between 0 and 63, with greater scores indicating greater psychological distress. Each subscale corresponds to 7 items, and the scores of the subscales can be determined by summing the relevant items in the scale and interpreting it based on the scoring table.[11]

Brief Resilience Scale

The Brief Resilience Scale (BRS), which was established and standardized by Smith *et al.*, was used to assess a person’s ability to bounce back from adverse events.[12] The questionnaire, which is unidimensional, was created to assess the ability to bounce back or recuperate from stress. The Smith BRS consists of 6 items that are scored on a Likert scale with 5 points, which range from strongly disagree to strongly agree. Item no 2, 4, and 6 of the scale are reverse scored. The BRS scale has been found to be reliable and has a unitary construct.

Data analysis

Descriptive statistics was used to understand the demographic characteristics as well as the variables of the present study. The latent class analysis (LCA) is a person-centered approach that aids toward determining homogeneous subgroups without any pre established labels. The LCA usually starts with a two-profile model, and the model structure is determined by various indicators, which are AIC, BIC, SABIC, entropy, LMR, and BRLT. Lower the score for the values of AIC, BIC, as well as SABIC, better the fit of the models.[13] Structural equation modeling was also utilized in order to understand the complex relationship among the variables and to test the hypothesized framework.

RESULTS

Table 1 determines the fit indices for the latent classes that were established on the basis of the ACEs. The index values for the different class memberships were generated using the R software. Lower the values of AIC, BIC, and SABIC, greater is the fit of the model with different classes. The four-class model was found to have the lowest sample-size adjusted BIC (SABIC) with Akaike Information Criterion (AIC) value reducing till the fourth class with an increase in the 5th class noticed for the mentioned values. The samples of the four identified classes were found to be unbalanced but were considered for further analysis due to the formation of theoretically meaningful classes in reference with previous studies that have utilized unbalanced classes.[14] Further studies have stated that classes with a minimum of 5% of the entire sample can be considered as a significant class.[15] On the basis of the composition of each class, the first class is labeled as “moderate childhood trauma” with 10.73% of the participants, 5.75% of the participants fall in the 2nd class, which is labeled as “mild childhood trauma”, the 3rd class with 75.45% of the participants is labeled as “severe childhood trauma,” and 7.95% of the participants fall in the 4th class, which is labeled as “no childhood trauma.”

Table 2 represents the sociodemographic details of the four latent classes that were observed along with the Chi-square analysis determining statistical significance. Majority of the participants were found to be pursuing arts and humanities which accounts to 284 participants, representing 73.4% of the sample. 153 participants

Table 1: Fit statistics for latent class analysis models

Model	Class	*n* (%	AIC	BIC	SABIC	BLRT	BLRT (*P*)
2	1	78 (20.14)	3278.79	3385.67	3300.00	570.04	0.59
	2	309 (79.86)					
3	1	64 (16.43)	3254.06	3416.36	3286.27	622.77	0.68
	2	296 (76.60)					
	3	27 (6.96)					
4	1	42 (10.73)	3223.74	3441.45	3266.94	681.10	0.67
	2	22 (5.75)					
	3	292 (75.56)					
	4	31 (7.95)					
5	1	119 (30.74)	3251.47	3524.60	3305.67	681.36	0.91
	2	17 (4.51)					
	3	12 (3.18)					
	4	56 (14.38)					
	5	183 (47.20)					

Source: Primary data. AIC: Akaike information criterion, BIC: Bayesian information criterion, SABIC: Sample size adjusted BIC, BLRT: Bootstrap likelihood ratio test

Table 2: Probability composition of each class

Variable	Category	Frequency (%)	Class 1	Class 2	Class 3	Class 4	χ^2	*P*
Education background	Arts and humanities	284 (73.4)	0.74	0.85	0.71	0.72	28.12	0.02*
	Science	84 (21.7)	0.19	0.15	0.24	0.23		
	Engineering	2 (0.5)	0.00	0.00	0.05	0.00		
	Management	14 (3.6)	0.02	0.00	0.00	0.04		
	Medicine	2 (0.5)	0.05	0.00	0.00	0.00		
	Law	1 (0.3)	0.00	0.00	0.00	0.00		
Birth order	First-born	153 (41.1)	0.37	0.30	0.43	0.43	13.60	0.14
	Middle born	63 (16.3)	0.14	0.26	0.19	0.16		
	Last-born	132 (34.1)	0.30	0.30	0.24	0.36		
	Only child	33 (8.5)	0.19	0.15	0.14	0.06		
Area of residence	Urban	345 (89.1)	0.91	0.81	0.67	0.91	17.84	0.01**
	Rural	38 (9.8)	0.09	0.15	0.33	0.08		
	Semiurban	4 (1.0)	0.00	0.04	0.00	0.01		
Mother occupation	Government employee	11 (2.8)	0.09	0.04	0.10	0.01	52.26	<0.001**
	Self-employed	57 (14.7)	0.23	0.30	0.10	0.13		
	Private employee	39 (10.1)	0.16	0.11	0.10	0.09		
	Homemaker	218 (56.3)	0.35	0.56	0.33	0.61		
	Retired	12 (3.1)	0.00	0.00	0.19	0.03		
	Unemployed	50 (12.9)	0.16	0.00	0.19	0.13		
Family type	Nuclear	313 (80.9)	0.84	0.70	0.67	0.82	14.88	0.09
	Joint	71 (18.3)	0.14	0.30	0.33	0.17		
	Other	3 (0.8)	0.00	0.00	0.00	0.01		
SES categories	Upper	7 (1.8)	0.07	0.00	0.00	0.01	25.87	0.01**
	Upper middle	67 (17.3)	0.21	0.33	0.14	0.16		
	Lower middle	158 (40.8)	0.33	0.59	0.43	0.40		
	Upper lower	120 (31.0)	0.35	0.07	0.38	0.32		
	Lower	35 (9.0)	0.05	0.00	0.05	0.11		

*Significant at 0.05 level of significance, **Significant at 0.01 level of significance. Source: Primary data, SES: Socioeconomic status

corresponding to 41.1% were found to be first born with 89.1% being urban residents. 313 participants accounting to 80.9% were found to be part of a nuclear family. 40.8% of the participants were part of the lower middle-income family. A distinguished association was found between educational background and the identified latent classes with a Chi-square value of 28.12, which is significant at 5% significance level. Among the educational background of the participants, it was found that arts and humanities had a high probability to fall under the latent class 2 with a probability of 0.85 and participants pursuing science were found to fall under class 3 with 0.24 probability, deemed to be the highest among classes. Other categories such as engineering, law as well as medicine had negligible representation among the different classes. A statistical significance was also identified in the area of residence with a Chi-square value of 17.84, which was significant at 1% significance level.

Higher probability was found among urban residents who were categorized into class one and class four with a probability of 0.91 and rural residents more likely falling under the class 3 with a probability of 0.33. The occupation of the participants' mothers was found to have high significant association with a Chi-square value of 52.26 with a value <0.01. Homemakers were more likely to fall under class 4 (0.61) and class 2 (0.56), while privately employed and self-employed individuals were more likely to fall in class 1. Similarly, high statistical significance was also notable in socioeconomic status with Chi-square value of 25.87, which was significant at 0.01 level of significance.

Table 3 denotes the probabilities of the different ACEs that are assigned to each of the latent classes. The Table 3 is color conditioned with darker shades of green indicating a higher probability of a specific ACE to occur in a specific latent class and the darker shades of red indicating the type of adversities that is least likely to occur in a class.

Table 4 presents the results of the one-way ANOVA, which states that there was a significant difference between depression, anxiety, and stress across the trauma classes with *F* values of 7.69, 13.18, and 8.90, respectively, which are substantial at 0.01 level of significance. The mean scores in the table highlight that the class "severe childhood trauma" has the highest level of stress (9.67), anxiety (10.62), and depression (10.29), and the least levels of stress (6.17), anxiety (6.5), and depression (6.63), were present in the "no childhood trauma" class.

Table 5 determines the model fit indices for the hypothesized model. The fit indices of Figure 1 show $P > 0.05$, thereby indicating that we accept the null hypothesis which states that the model is a good fit. A value of 1.897 was identified for the Chi-square degrees of freedom (x^2/df), which is found to be lesser than the suggested value. In addition, the other fit indices also indicated a good fit of the model with the values of Goodness-of-Fit Index, Adjusted Goodness-of Fit Index, Normed Fit Index, Comparative Fit Index, as well as Tucker Lewis Index being within the suggested threshold limit as mentioned in Table 5. From the analysis, it was found that ACE had a significant impact on anxiety ($\beta = 0.324$, $P < 0.001$) and depression ($\beta = 0.282$, $P < 0.001$) with no statistically significant impact noted on stress ($\beta = 0.049$, $P = 0.163$). The bootstrapped mediation analysis that was conducted with 5000 iterations did not show any statistically significant indirect effect of resilience and socioeconomic status between the link of ACEs and psychological distress. The β coefficient values of resilience between ACEs with depression, anxiety, and stress were − 0.020, −0.013, and − 0.009, respectively. The β coefficient values of SES between ACEs with depression, anxiety, and stress were 0.011, 0.001, and 0.003, respectively. Thus, resilience and SES does not mediate the link between ACEs and psychological distress.

DISCUSSION

The current study aimed to identify ACE profiles and its influence on the various psychosocial predictors. From the results, it was found

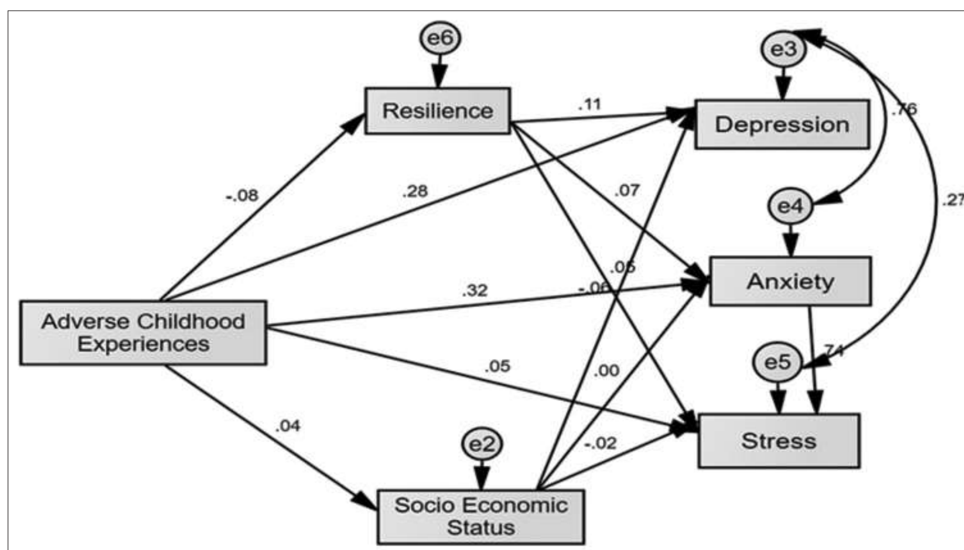

Figure 1: Structural equation model framework

Table 3: Class membership probabilities on the basis of adverse childhood experiences

ACE	Class 1 probability	Class 2 probability	Class 3 probability	Class 4 probability
1.Physical Abuse	0.43	0.58	0.5	0.21
2.Emotional Abuse	0.03	0.04	0.49	0.17
3.Contact sexual abuse	0.73	0.69	0.86	0.52
4.Alcohol and/or drug abuser in the household	0.01	0.02	0.01	0
5. Incarcerated household member	0	0.1	0.4	0
6. Someone chronically depressed, mentally ill, institutionalized or suicidal	0.26	0.17	0.27	0
7. Household member treated violently	1	0.17	0.95	0.12
8. One or no parents, parental separation or divorce	0.24	0.26	0.42	0.05
9. Emotional neglect	0.58	0.15	0.47	0.31
10. Physical neglect	0.27	0.17	0.83	0.13
11. Bullying	0.2	0.2	0.44	0.02
12. Community violence	0	0.67	0.93	0.04
13. Collective violence	0.29	0.59	0.63	0.09

Source: Primary data. ACE: Adverse childhood experiences

Table 4: The effect of class membership on depression, anxiety and stress

Variable	Moderate childhood trauma	Mild childhood trauma	Severe childhood trauma	No childhood trauma	*F*	*P*
Stress	9.58 (5.35)	7.44 (4.07)	9.67 (4.02)	6.17 (4.93)	8.90	<0.001***
Anxiety	10.42 (4.11)	8.89 (4.81)	10.62 (3.76)	6.5 (4.94)	13.18	<0.001***
Depression	9.74 (5.15)	7.07 (4.6)	10.29 (4.22)	6.63 (5.05)	7.69	<0.001***

***Significant at 1% level of significance. Source: Primary data

Table 5: Model fit indices for the hypothesized model

Indices	SEM value	Suggested value
χ^2/DF	1.897	<5.00
GFI	0.998	>0.90
AGFI	0.966	>0.90
NFI	0.993	>0.90
CFI	0.999	>0.90
TLI	0.983	>0.90
RMSEA	0.048	<0.08

Source: Primary data. GFI: Goodness-of-Fit Index, AGFI: Adjusted GFI, NFI: Normed Fit Index, CFI: Comparative Fit Index, TLI: Tucker Lewis Index, RMSEA: Root mean square error of approximation, SEM: Structural equation model

that a significant difference was found on the area of residence and socioeconomic status in relation with the various ACE classes. The results were supported by a study that stated a presence of significant difference that persists with the exposure of ACEs as well as the urban and rural background of the children.[16]

The present study also stated that the rural participants have higher probability to be exposed to severe trauma. These results are found to be in line with a study, which states that in comparison to urban children, children from the rural areas are found to be exposed to most of the childhood adversities. The results of the study also indicate that poverty increases the susceptibility of being exposed to ACEs.[16]

The class separation in accordance to the 13 childhood adversities have also been mentioned in the results. The class one was labeled as moderate childhood trauma with the group portraying high probability of emotional neglect and household member treated violently. Basic needs of children are not being met due to the risk of domestic violence, where abused mothers find it difficult to cope with the consequences of violence inflicted by the partner.[17] The class two which was labeled as mild childhood trauma was found to have the highest probability for physical abuse. Retrospective literature studies show that the exposure to physical abuse which is the act of deliberately causing harm or indulging in violent behavior toward another person, therein causing bodily injury during childhood are found to cause problems in health and maladaptation in behavior during adulthood.[18]

The findings of the present study show a significant difference between depression, anxiety, as well as stress in respect to the four ACE-related membership classes identified. Further, it was determined that the probability for depression, anxiety, and stress was found to be higher in the severe childhood trauma class with least probability identified in the no childhood trauma class. Strong association is found between exposure to ACEs as well as an increased risk for depression.[19] Another study states that there is a strong association between depression, anxiety, and stress and the exposure to cumulative childhood adversities.[20] The findings align with a study which states that a broad multifactorial association exists between internalizing problems such as Depression, Anxiety and Stress and the different types of ACEs.[21]

Thus, the current study puts forward the strong association between childhood adversities and adult mental health outcomes among the college students. However, the study comes with its own limitations. The study's sample size is in accordance to the minimum requirement for nonprobability sampling, but can be considered to be small for LCA. Further, the presence of unbalanced classes puts forth the need for a bigger sample size. Future studies, thus, can focus on replicating the present study with a bigger sample. The current study looks into the adult socioeconomic status of the participants, whereas future studies can look into the childhood socioeconomic status and its impact on ACEs. Further other protective factors apart from resilience can be explored in future studies.

CONCLUSIONS

The study portrays the different drastic outcomes that arises in later phases of life due to various ACEs and the influence of adult socioeconomic status and resilience between ACEs and mental health outcomes. These findings put forward the long-term psychological consequences of childhood adversities and stress, thereby aiding in early identification as well as intervention strategies. This, therein, provides the opportunity to mitigate lasting effects and promote resilience. Thus, the current study stands to be an exclusive guide for policy makers, practitioners, and clinicians to identify the co-occurrence of adversities and their impact on adult well-being.

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Author contributions

Concepts: Nellore Pratika Reddy; Design: Nellore Pratika Reddy; Definition of intellectual content: Kailash Sureshkumar; Data acquisition: Nellore Pratika Reddy; Data analysis: Nellore Pratika Reddy; Statistical analysis: Kailash Sureshkumar; Manuscript preparation: Nellore Pratika Reddy; Manuscript editing: Kailash Sureshkumar; Manuscript review: Kailash Sureshkumar; Guarantor: Kailash Sureshkumar.

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Conflicts of interest

There are no conflicts of interest.

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Original Article

The role of negative affectivity and detachment in the relationship between dark triad personality and suicidal behavior: A chain-mediated model analysis

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Abstract

Background: The dark triad personality (DTP) is associated with an increase in adverse consequences related to risky behaviors. While studies have concentrated on the interpersonal issues associated with DTPs (Machiavellianism [MV], narcissism [NS], and psychopathy [PP]), there is a scarcity of research examining the links between DTP and intrapersonal challenges, particularly in relation to suicide.

Aim: The study aims to assess the relationship between DTP and suicidal behavior (SB). Specifically, the study examines the chain mediating effects of negative affectivity (NA) and detachment (DET) in the association between these DTPs and SB among college students.

Materials and Methods: The study employed a cross-sectional quantitative design and included 321 college students aged 18–29 years, comprising both genders. Participants were recruited using a convenience sampling method through online Google Forms. Data were collected using standardized instruments, including Short Dark Triad, SB Questionnaire, and Personality Inventory for DSM-5–Short Form (PID-5-SF).

Results: The prevalence of SB was 27.4%. Specifically, the rates were 12.4% for male students and 14.9% for female students, with no significant gender difference. There was a significant positive association found between MV, NS, PP, NA, DET, and SB ($P < 0.01$). The direct effect of DTPs on SB was significant. However, the total indirect effect of DTPs on SB through NA and DET was significant, indicating that both NA and DET serially and partially mediated this association among college students.

Conclusion: The present study findings underscore the complex interplay between DTPs, emotional processes, and SB among college students.

Keywords: Machiavellianism, narcissism, personality, psychopathy, students, suicide

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INTRODUCTION

The dark triad personality (DTP) refers to a cluster of three subsyndromal personality traits: Machiavellianism (MV), narcissism (NS), and psychopathy (PP).[1,2] MV is characterized by a manipulative and deceptive interpersonal style,[3] PP by diminished empathy, impaired social regulation, impulsivity, and lack of remorse that may lead to harm to others,[4] and NS by an antagonistic interpersonal orientation marked by elevated narcissistic traits.[5,6] Collectively, these traits share features of manipulation and emotional callousness,[7] and their interplay was linked to an increased risk of adverse outcomes and risky behaviors.[2] While much research has focused on the interpersonal difficulties associated with DTP, studies examining its intrapersonal correlates, particularly in relation to suicide, remain limited.[8] According to the Interpersonal Theory of Suicide, individuals with Machiavellian and psychopathic traits may struggle to form stable, meaningful relationships, thereby increasing vulnerability to suicidal ideation.[9] Individuals exhibiting NS traits, particularly those characterized by vulnerable NS, often encounter negative emotional states and unstable self-esteem.[10] Suicidal ideation may arise from attempts to regulate self-worth or protect a

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fragile sense of flawlessness, while severe narcissistic injury can elicit intense shame, leading individuals to perceive suicide as the only option.[11] Chabrol *et al*.[12] reported elevated suicidal behaviors (SBs) among individuals with MV, PP, NS, and sadistic traits. SBs can be defined as a continuum encompassing thoughts about taking action to terminate one's life, the development of a concrete plan to carry out such an act, and behaviors that may result in self-harm with a certain degree of intent to end one's life.[13] Among college students, lifetime and past-year prevalence of suicide attempts were 5.2% and 4.5%, respectively.[14] Wang *et al*.[8] suggested that DTP traits may be an overlooked predictor of suicidal ideation.

Mediating role of negative affectivity and detachment

Negative affectivity (NA) refers to a dispositional tendency to experience negative emotional responses toward both external situations and oneself.[15] The present study focused on trait negative affect, reflecting enduring and stable negative emotionality over time rather than transient emotional states.[16] Detachment (DET), akin to low extraversion, is characterized by depressive affect, social withdrawal, and diminished trust in interpersonal relationships.[17] High NA and DET are linked to risky behaviors, including suicidal ideation and nonsuicidal self-injury,[18,19] with NA predicting stronger within-person links between interpersonal dysfunction and suicidal thoughts.[20] One study revealed that individuals experiencing suicidal ideation were more likely to have lower levels of extraversion,[21] a trait comparable to DET.[17] Additionally, elevated narcissistic traits have been associated with higher NA and a greater propensity for quarrelsomeness in response to perceptions of others' dominance.[22] Research has linked MV to neuroticism, heightened negative emotions, poor self-control, stress management difficulties, depression, anxiety, low empathy, impaired affective theory of mind, alexithymia, and anhedonia.[23-25] Furthermore, individuals exhibiting MV traits are often described as emotionally detached and lacking genuine engagement with others.[25,26] Hicks and Patrick highlighted that understanding the link between PP and negative emotionality is among the most complex and conceptually significant challenges in PP research.[27] Evidence suggested that PP is associated with elevated neuroticism, NA, and DET.[28-30] Based on the above findings, it can be considered that NA and DET may serve as significant mediators in the relationship between DTP and SB among university students.

The present study

To the best of our knowledge, there is a lack of research conducted in India that investigates the influence of DTPs on SB using chain mediation analysis. Given the identified gap in the literature, the present study aims to investigate the relationship among DTPs (MV, NS, and SP), NA, DET, and SB. In particular, the research focuses on the serial mediating roles of NA and DET in the association between DTPs (MV, NS, and PP) and SB among college students. The hypotheses are outlined as follows:

- H1: There is a significant relationship between NA, DET, DTP, and SB among college students
- H2: DTPs (MV, NS, and PP) significantly predict SB among college students
- H3: NA and DET significantly mediate the relationship between MV and SB among college students
- H4: NA and DET significantly mediate the relationship between NS and SB among college students
- H5: NA and DET significantly mediate the relationship between PP and SB among college students.

MATERIALS AND METHODS

Research design

The present study was approved by the Institute Ethics Committee of Mahatma Gandhi Medical College and Hospital, Jaipur (No. MGMCandH/IEC/JPR/2024/4234; dated 21/11/2024) and conducted in accordance with the Declaration of Helsinki and reporting guidelines STROBE checklist. The present study employed a cross-sectional, quantitative design. A priori power analysis using GPower 3.1 indicated that a minimum sample of 138 was required to detect significant mediation effects in a model with five predictors [see Figure 1]. Participants were recruited using a nonprobability convenience sampling method. This sampling method was used due to the convenient access and the ample number of students within the required age range. The data collection process involved the creation of Google Forms. Subsequently, the Google Forms was distributed via WhatsApp. All items were set as mandatory in Google Forms to prevent missing data; therefore, no missing data were observed in the dataset. A total of 354 responses were received from college students in the southern states of India. Data were collected from December 2024 to January 2025. To minimize the duplicate entries, the E-mail addresses of participants were collected, and after screening, no duplicate responses were found. Prior to the main analysis, the data were screened for errors and incomplete responses, resulting in a total of 321 valid responses [Figure 2]. The study included college students aged 18–29 years, of both genders, who were enrolled in college at the time of data collection, were able to read and understand English, and had access to the internet. Further, Harman's single-factor test revealed that the first factor accounted for the total variance of 7.52%, which falls short of the critical threshold of 50%, indicating that common method bias does not pose a significant issue in this study.[31] The sample comprised both male (45.5%) and female (54.5%) students, with a mean age of 26.73 years (SD = 2.07). Participants included 42.1% postgraduate students, 32.1% undergraduate students, and 25.8% medical students. All participants provided digital informed consent, and confidentiality and anonymity of their responses were ensured.

Measurements

The short dark triad

The short dark triad (SD3)[32] was used to assess the three socially aversive traits – MV, NS, and PP. It comprises 27 items rated on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). This scale has been used in previous Indian studies.[33] The Cronbach's alpha values ranged from 0.68 to 0.74, and the inter-item correlations ranged from 0.22 to 0.40.[32] In the present study, Cronbach's alpha coefficients were 0.621 for MV, 0.638 for NS, and 0.626 for PP, indicating acceptable internal consistency.

Suicidal Behavior Questionnaire-Revised

The Suicidal Behavior Questionnaire-Revised (SBQ-R) is a self-report measure assessing four dimensions of suicidality: (a) lifetime occurrence of SBs, (b) suicidal thoughts in the past year, (c) risk of

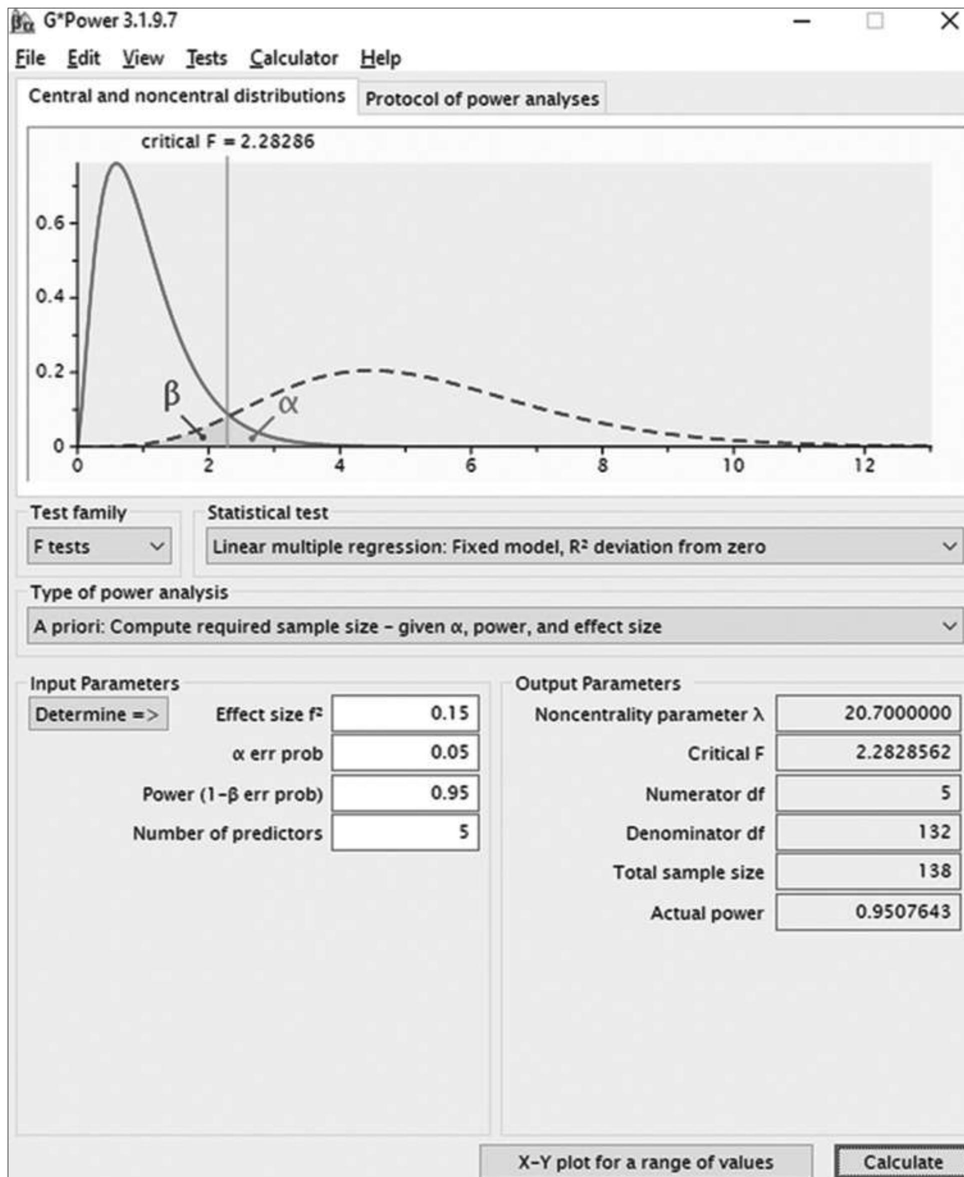

Figure 1: Output of G*Power software for sample size determination

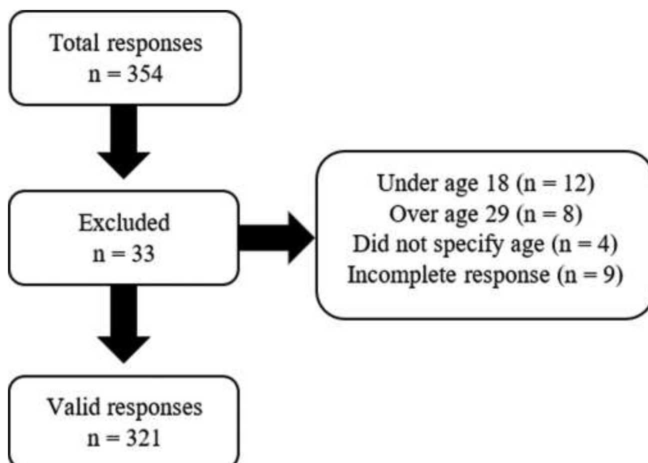

Figure 2: Participants' flow diagram

suicide attempt, and (d) self-reported likelihood of future SB. In the general adult population, a cutoff score of ≥7 on the SBQ-R yields a sensitivity of 93% and specificity of 95%.[34] Accordingly, in the present study, an SBQ-R score ≥7 was used as a positive screen to calculate prevalence. In the present study, the Cronbach's alpha was 0.696, indicating acceptable internal consistency.

Personality Inventory for DSM-5–Short Form

The Personality Inventory for DSM-5–Short Form (PID-5-SF) comprises 25 items rated on a 4-point Likert scale from 0 ("very false or often false") to 3 ("very true or often true"), divided into five domains. The present study focused on two domains, negative affect and DET. The Cronbach's alpha ranged from 0.72 to 0.96 (median = 0.86).[35,36] In the present study, the Cronbach's alpha was 0.660 for negative affect and 0.632 for DET domain, indicating acceptable internal consistency.

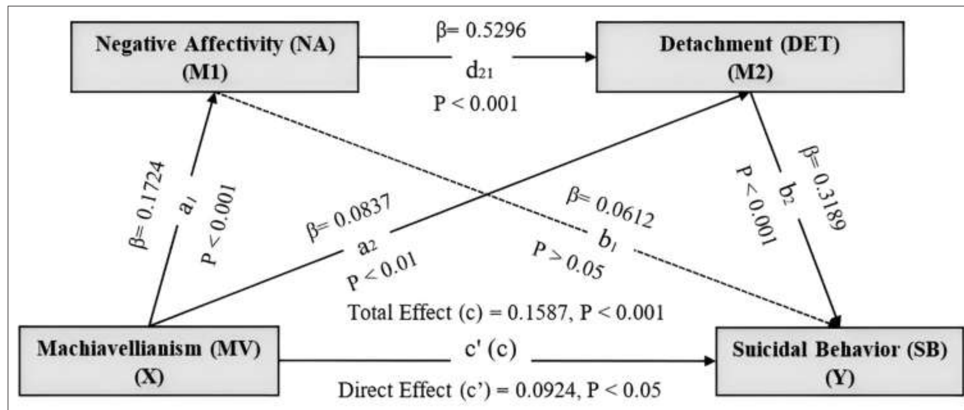

Figure 3: The chain-mediated model that predicts suicidal behavior through the lens of Machiavellianism, a component of the dark triad personality, mediated by negative affectivity and detachment

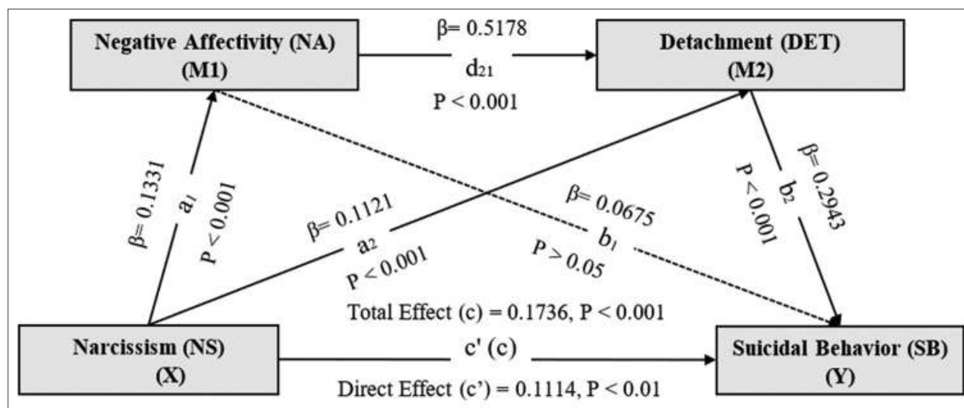

Figure 4: The chain-mediated model that predicts suicidal behavior through the lens of narcissism, a component of the dark triad personality, mediated by negative affectivity and detachment

Table 1: The Pearson's correlation coefficient analysis between Machiavellianism, narcissism, psychopathy, negative affectivity, detachment, and suicidal behavior (*n*=321)

Variables	MV	NS	PP	NA	DET	SBQ
MV	1					
NS	0.449**	1				
PP	0.347**	0.499**	1			
NA	0.277**	0.241**	0.295**	1		
DET	0.263**	0.307**	0.348**	0.530**	1	
SBQ	0.189**	0.234**	0.232**	0.210**	0.306**	1

**Correlation is significant at the 0.01 level. MV: Machiavellianism, NS: Narcissism, PP: Psychopathy, NA: Negative Affectivity, DET: Detachment, SBQ: Suicidal Behavior Questionnaire

Statistical analysis

The data were analyzed using IBM SPSS Statistics for Windows, Version 22 (IBM Corp., Armonk, New York, USA). Prior to the main analysis, a descriptive analysis was performed to assess the mean and SD of the study variables. In the subsequent stage, an independent *t*-test was performed to assess the significant gender differences in SB among university students. Internal consistency was calculated using Cronbach's alpha for all the scales used in the study, with acceptable values of 0.6 or 0.7.[37] Additionally, Pearson correlation coefficient was used to assess the significant association among the study variables. Furthermore, a three-chain-mediated analysis was performed using Hayes PROCESS Macro (Model 6) 5000 bootstraps.[38] For each analysis, $P < 0.05$ was used to determine statistical significance.

RESULTS

Prevalence of suicidal behavior and correlation analysis

The prevalence of SB was 27.4%, with 12.4% in males and 14.9% in females; no significant gender difference was observed ($t = 1.586$, $P = 0.114$, 95% confidence interval (CI) [−0.15353, 1.43149], Cohen's $d \approx 0.18$). Pearson correlation analysis showed significant positive associations among MV, NS, PP, NA, DET, and SB ($P < 0.05$), supporting hypothesis 1 [Table 1].

Machiavellianism and suicidal behavior

In the present study, three-chain mediation analyses were conducted. The first analysis examined the sequential mediating effects of NA and DET in the relationship between MV and SB [Table 2 and Figure 3]. The direct effect (c') of MV on SB was significant ($\beta = 0.0924$, $t = 1.98$, $P < 0.05$, 95% CI [0.0004, 0.1843]), supporting hypothesis 2. The direct effect accounted for 58% of the total effect. Additionally, the indirect effect of MV on SB through NA was not significant (Ind1: $\beta = 0.0105$, $t = 0.69$, $P > 0.05$, 95% CI [−0.0213, 0.0398]). In contrast, DET significantly mediated the relationship between MV and SB (Ind2: $\beta = 0.0267$, $t = 2.26$, $P < 0.05$, 95% CI [0.0066, 0.0527]), accounting for 17% of the total effect. Moreover, the indirect effect of MV on SB

through NA and DET in sequence was found to be significant (Ind3: β = 0.0291, t = 2.83, P < 0.05, 95% CI [0.0118, 0.0519]), accounting for 18% of the total effect. Therefore, the chain mediating effect of NA and DET in the association between MV and SB was considered a partial mediation, supporting hypothesis 3. However, no significant differences were found between the three indirect pathways (Ind1 vs. Ind2: β = −0.0162, t = −0.74, P > 0.05, 95% CI [−0.0611, 0.0245]; Ind1 vs. Ind3: β = −0.0186, t = −0.86, P > 0.05, 95% CI [−0.0663, 0.0198]; Ind2 vs. Ind3: β = −0.0024, t = −0.18, P > 0.05, 95% CI [−0.0310, 0.0240]). The total indirect effect was significant (β = 0.0664, t = 3.73, P < 0.05, 95% CI [0.0330, 0.1028]), accounting for 42% of the total effect. Finally, the total effect (c) of MV on SB was also significant (β = 0.1587, t = 3.45, P < 0.001, 95% CI [0.0681, 0.2494]).

Narcissism and suicidal behavior

The second chain mediation analysis assessed the sequential mediating effect of NA and DET in the relationship between NS and SB [Table 3 and Figure 4]. The direct effect (c') of NS on SB was statistically significant (β = 0.1114, t = 2.69, P < 0.01, 95% CI [0.0300, 0.1927]), supporting hypothesis 2. The direct effect (NS → SB) accounted for 64% of the total effect. Additionally, the indirect effect of NS on SB through NA was not significant (Ind1: β = 0.0090, t = 0.79, P > 0.05, 95% CI [−0.0134, 0.0328]). In contrast, DET significantly mediated the relationship between NS and SB (Ind2: β =0.0330, t = 2.75, P < 0.05, 95% CI [0.0117, 0.0581]), accounting for 19% of the total effect. Moreover, the indirect effect of NS on SB through NA and DET in sequence was also significant (Ind3: β = 0.0203, t = 2.67, P < 0.05, 95% CI [0.0076, 0.0367]), accounting for 12% of the total effect. Therefore, the chain mediating effect of NA and DET in the relationship between NS and SB was considered a partial mediation, supporting hypothesis 4. However, no significant differences were found between the three indirect pathways (Ind1 vs. Ind2: β = −0.0240, t = −1.22, P > 0.05, 95% CI [−0.0633, 0.0135]; Ind1 vs. Ind3: β = −0.0113, t = −0.71, P > 0.05, 95% CI [−0.0441, 0.0179]; Ind2 vs. Ind3: β = 0.0127, t = 1.18, P > 0.05, 95% CI [−0.0080, 0.0351]). The total indirect effect was significant (β = 0.0622, t = 3.91, P < 0.05, 95% CI [0.0334, 0.0958]), accounting for 36% of the total effect. Finally, the total effect (c) of NS on SB was also significant (β = 0.1736, t = 4.30, P < 0.001, 95% CI [0.0941, 0.2531]).

Psychopathy and suicidal behavior

The third chain mediation analysis assessed the sequential mediating effect of NA and DET in the relationship between PP and SB [Table 4 and Figure 5]. The direct effect (c') of PP on SB was statistically significant (β = 0.0998, t = 2.40, P < 0.05, 95% CI [0.0180, 0.1816]), accounting for 59% of the total effect. Additionally, the indirect effect of PP on SB through NA was not significant (Ind1: β = 0.0098, t = 0.70, P > 0.05, 95% CI [−0.0190, 0.0374]). In contrast, DET significantly mediated the relationship between PP and SB (Ind2: β = 0.0359, t = 2.74, P < 0.05, 95% CI [0.0136, 0.0638]), accounting for 21% of the total effect. Moreover, the indirect effect of PP on SB through NA and DET in sequence was also significant (Ind3: β =0.0237, t = 2.79, P < 0.05, 95% CI [0.0094, 0.0418]), accounting for 14% of the total effect. Therefore, the serial mediation effect of NA and DET in the relationship between PP and SB was considered a partial mediation, supporting hypothesis 5. However, no significant differences were found between the three indirect pathways (all P > 0.05). The total indirect effect was significant (β = 0.0694, t = 3.79, P < 0.05, 95% CI [0.0354, 0.1073]), accounting for 41% of the total effect. Finally, the total effect (c) of PP on SB was significant (β = 0.1692, t = 4.26, P < 0.001, 95% CI [0.0910, 0.2474]). The total indirect effect was significant (β = 0.0694, t = 3.79, P < 0.05, 95% CI [0.0354, 0.1073]),

Table 2: The chain-mediated effects of Machiavellianism on suicidal behavior through negative affectivity and detachment (*n*=321)

Effect	Effect model	Effect	*t*	*P*	LLCI	ULCI	Effect ratio (%)
Direct effect	MV → SB	0.0924	1.98	<0.05	0.0004	0.1843	58
Indirect effect	Ind1	0.0105	0.69	>0.05	−0.0213	0.0398	-
	Ind2	0.0267	2.26	<0.05	0.0066	0.0527	17
	Ind3	0.0291	2.83	<0.05	0.0118	0.0519	18
	Ind1 minus Ind2	−0.0162	−0.74	>0.05	−0.0611	0.0245	
	Ind1 minus Ind3	−0.0186	−0.86	>0.05	−0.0663	0.0198	
	Ind2 minus Ind3	−0.0024	−0.18	>0.05	−0.0310	0.0240	
Total indirect effect		−0.0664	3.73	<0.05	0.0330	0.1028	42
Total effect		0.1587	3.45	<0.001	0.0681	0.2494	100

LLCI: Lower limit of confidence interval, ULCI: Upper limit of confidence interval, indirect effect key: Ind1: MV → NA → SB, Ind2: MV → DET → SB, Ind3: MV → NA → DET → SB, MV: Machiavellianism, NA: Negative affectivity, DET: Detachment, SB: Suicidal behavior

Table 3: The chain-mediated effects of narcissism on suicidal behavior through negative affectivity and detachment (*n*=321)

Effect	Effect model	Effect	*t*	*P*	LLCI	ULCI	Effect ratio (%)
Direct effect	NS → SB	0.1114	2.69	<0.01	0.0300	0.1927	64
Indirect effect	Ind1	0.0090	0.79	> 0.05	−0.0134	0.0328	-
	Ind2	0.0330	2.75	<0.05	0.0117	0.0581	19
	Ind3	0.0203	2.67	<0.05	0.0076	0.0367	12
	Ind1 minus Ind2	−0.0240	−1.22	>0.05	−0.0633	0.0135	
	Ind1 minus Ind3	−0.0113	−0.71	>0.05	−0.0441	0.0179	
	Ind2 minus Ind3	0.0127	1.18	>0.05	−0.0080	0.0351	
Total indirect effect		0.0622	3.91	<0.05	0.0334	0.0958	36
Total effect		0.1736	4.30	<0.001	0.0941	0.2531	100

LLCI: Lower limit of confidence interval, ULCI: Upper limit of confidence interval, indirect effect key: Ind1: NS → NA → SB, Ind2: NS → DET → SB, Ind3: NS → NA → DET → SB, NS: Narcissism, NA: Negative affectivity, DET: Detachment, SB: Suicidal behavior

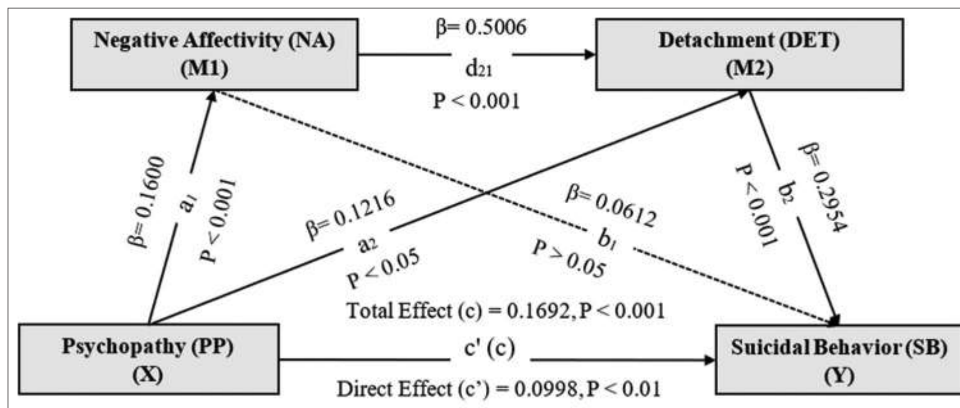

Figure 5: The chain-mediated model that predicts suicidal behavior through the lens of psychopathy, a component of the dark triad personality, mediated by negative affectivity and detachment

Table 4: The chain-mediated effects of psychopathy on suicidal behavior through negative affectivity and detachment (*n*=321)

Effect	Effect model	Effect	*t*	*P*	LLCI	ULCI	Effect ratio%
Direct effect	PP → SB	0.0998	2.40	<0.05	0.0180	0.1816	59
Indirect effect	Ind1	0.0098	0.70	>0.05	−0.0190	0.0374	-
	Ind2	0.0359	2.74	<0.05	0.0136	0.0638	21
	Ind3	0.0237	2.79	<0.05	0.0094	0.0418	14
	Ind1 minus Ind2	−0.0261	−1.16	>0.05	−0.0721	0.0164	
	Ind1 minus Ind3	−0.0139	−0.74	>0.05	−0.0537	0.0218	
	Ind2 minus Ind3	0.0123	1.12	>0.05	−0.0082	0.0357	
Total indirect effect		0.0694	3.79	<0.05	0.0354	0.1073	41
Total effect		0.1692	4.26	<0.001	0.0910	0.2474	100

LLCI: Lower limit of confidence interval, ULCI: Upper limit of confidence interval, indirect effect Key: Ind1: PP → NA → SB, Ind2: PP → DET → SB, Ind3: PP → NA → DET → SB, PP: Psychopathy, NA: Negative affectivity, DET: Detachment, SB: Suicidal behavior

accounting for 41% of the total effect. Finally, the total effect (c) of PP on SB was also significant ($\beta = 0.1692$, $t = 4.26$, $P < 0.001$, 95% CI [0.0910, 0.2474]).

DISCUSSION

In the present study, the prevalence of SB was 27.4%, comparable to findings from Bangladesh.[39] Gender-wise prevalence was 12.4% in males and 14.9% in females, with no significant difference, consistent with prior evidence indicating insignificant gender differences in SB.[34,40,41] SB among college students may be linked to interpersonal challenges during the transition to college, as they leave home and adjust to new social contexts. Although they have reached sexual maturity and actively pursue educational and career goals, they often lack a stable life structure, marked by fluctuations in relationships, peer networks, academic decisions, and career plans, compared to adults.[42,43]

The study finding indicates that college students exhibiting these DPTs are more likely to experience higher levels of SB. A longitudinal study reported a significant positive correlation between the DTP and suicidal ideation.[8] Furthermore, the chain mediation analysis demonstrated that NA and DET significantly serially mediated the relationship between DPTs and SB. Individuals high in NA may exhibit frequent mood fluctuations, heightened emotional distress, and difficulties in emotion regulation, whereas those scoring high on DET may struggle to form interpersonal connections, prefer solitude, and appear emotionally distant or indifferent in social interactions.[34,35] Together, these emotional vulnerabilities heighten the risk of SB among college students with DTP. Although the DTP is often viewed as reflecting strong self-confidence, emerging evidence on its vulnerable dimension suggests underlying self-doubt; for instance, vulnerable NS is marked by unstable identity, low self-worth, hypervigilant and avoidant interpersonal styles, and elevated NA and DET.[44,45] Studies have revealed that students exhibiting elevated levels of PP and MV were associated with increased psychological distress.[46] DET has been strongly associated with both suicidal ideation and SB among college students, while NA was specifically linked to suicidal ideation; moreover, internalizing personality pathology predicts suicidal thoughts and actions, whereas externalizing behaviors predict suicidal actions.[47] Additionally, a prior study has demonstrated a strong relationship between negative mood states and challenges in regulating emotions in association with suicidal ideation.[48,49]

CONCLUSION

In conclusion, the present study findings underscore the importance of implementing preventive measures against SB in college students, particularly through psychological interventions that address both NA and DET in individuals with DTP. Social skills training may help reduce DET and strengthen social support, mitigating related risks.

Limitations and future directions

The present study has several limitations. First, due to its cross-sectional design, it is not possible to establish causal relationships. Consequently, longitudinal studies are necessary to determine causality. The sample was drawn from a single geographic region and consisted solely of college students, limiting

generalizability to other populations. The study did not control for the presence of other psychiatric disorders that may influence SB. Given the number of analyses conducted, findings should be interpreted cautiously due to potential multiplicity, and no formal adjustments for multiple comparisons were made. Finally, the use of convenience sampling and self-report measures via an online survey may have introduced potential reporting bias, although a common method bias check was conducted and reported.

Data availability statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request and are not publicly accessible to protect participant privacy.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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Original Article

Association between smartphone addiction, chronotype, emotional regulation, and physical activity among medical undergraduates – A cross-sectional study

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Abstract

Background: Smartphones play an indispensable role in our day-to-day activities. Addiction to smartphones is being increasingly reported, especially among young medical undergraduates. Individuals with eveningness chronotype and lower emotional intelligence are associated with increased smartphone use and academic decline. Physical activity is limited in those with increased smartphone use and eveningness chronotype. The current study aimed to assess the prevalence of smartphone addiction and its relationship with chronotypes, emotional regulation, and physical activity levels among medical undergraduates.

Methods: A cross-sectional observational study was carried out among undergraduate medical students. Smartphone addiction was ascertained by Smartphone Addiction Scale Short Version (SAS-SV), chronotype was assessed using Reduced Morningness-Eveningness Questionnaire (RMEQ), emotional regulation was assessed using emotion regulation questionnaire (ERQ), and physical activity using International Physical Activity Questionnaire-Short Form (IPAQ-SF).

Results: A total of 162 medical undergraduates were recruited for the study. The prevalence of smartphone addiction was found to be 52.5%. The students with evening chronotypes had a higher prevalence of smartphone addiction (c2 =14.888; $p<0.001$). The students with smartphone addiction were found to have reduced levels of physical activity (U=2212.5; $p<0.001$). Further, increased severity of smartphone addiction was associated with eveningness chronotype (r=-0.247, $p=0.002$) and lower physical activity (r=-0.151, $p=0.05$). However, no statistically significant association could be made out between emotional regulation of the participants to smartphone addiction, chronotype or physical activity levels.

Conclusion: The prevalence of smartphone addiction among undergraduate medical students was 52.5%. Individuals with smartphone addiction belonged to the eveningness chronotype and had lower physical activity levels.

Keywords: Exercise, medical students, sleep quality, smartphone usage

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INTRODUCTION

Smartphone use is inherently embedded in our daily lives. Usage of smartphones is most common among adolescents and young adults. Smartphone addiction is increasingly identified among university students, especially among medical undergraduates. It is well established that young adults studying in professional courses are exposed to a psychosocial milieu that makes them susceptible to sleep- and addiction-related disorders.[1,2]

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Smartphone addiction among medical undergraduates

Students are increasingly tethered to their screens often at the expense of their concentration, sleep, mental abilities, and real-world engagement. The prevalence of smartphone addiction among medical students is around 39%, as revealed by a recent global meta-analysis.[3] Another recent meta-analysis, which focused on

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medical students belonging to Asian nations, revealed a higher prevalence of 41.93%.[4] Medical students used their smartphones mostly for social relationships (such as texting and sharing photos), followed by academic purposes.[3] Marked gender differences do exist in the burden of smartphone addiction among medical students: female students had a higher prevalence than males; male students often used smartphones for gaming and females used smartphones for multimedia applications and social networking.[5-7]

The overuse of smartphone has become a public health problem as it leads to depression, anxiety, overweight, poor sleep quality and academic performance, and sedentary lifestyle.[8] Increasing levels of smartphone addiction were associated with worse sleep quality, high levels of stress, anxiety, depression, and reduced general well-being among Asian medical students. Personality characteristics such as novelty seeking and impulsivity are associated with developing smartphone addiction.[9]

Smartphone usage and chronotype

Smartphone overuse was closely associated with poor self-reported sleep quality, sleep deprivation, and sleep latency prolongation.[3] Even after adjusting for sociodemographic, Internet use parameters, and lifestyle behaviors, "eveningness" chronotype is associated with poor sleep quality.[10,11] Recent studies reveal that eveningness or evening-oriented adolescents and sleep procrastination are more prone to develop smartphone addiction.[7,12-16] Further, eveningness chronotype and smartphone addiction have been shown to impact academic grades,[17] substance abuse,[18] and perceived social support[19] and increase the suicide risk among adolescents/college students.[20] Eveningness was also associated with "phubbing" among adolescents and emergence of subsyndromal psychiatric symptoms.[21,22] A study among medical students and allied health sciences students revealed that "eveningness" chronotype had higher rates of smartphone addiction when compared to the other two chronotypes.[23]

Smartphone usage and emotional regulation

Low levels of emotional intelligence are associated with high levels of addictive behaviors including behavioral addictions such as smartphone addiction.[24,25] There exists a bidirectional relationship between negative emotional states and smartphone addiction, with each influencing the other in significant ways.[26] Studies reveal that increased levels of perceived stress and the negative emotions associated with the stress are linked to developing smartphone addiction among medical college students.[27,28]

On the other hand, studies also report that increasing levels of smartphone addiction among medical students were associated with heightened anxiety states and depressed mood, especially in those with "neuroticism" personality traits.[29] High levels of smartphone usage were associated with greater severity of negative emotional states such as depression and anxiety.[30,31]

Smartphone usage and physical activity

Smartphone usage and time spent in physical activity are known to have inverse relationships.[32] Longer periods of smartphone usage are associated with poorer physical fitness in terms of slow sprint times, low counts of pull-ups, and reduced vital capacity.[33] Empirical evidence suggests that engaging in regular physical activity, particularly at a frequency of two to three sessions per week, is associated with improved sleep quality[8] and a measurable reduction in symptoms related to smartphone addiction.[34-41]

Moderate and vigorous intensity exercises decrease Internet addiction when compared with light intensity exercises.[42] Moderate-to-vigorous intensity exercise reduces smartphone dependency mainly by enhancing endorphin release, improving mood, fostering resilience, and increasing social interaction, which buffers stress and anxiety linked to smartphone addiction.[40]

Furthermore, among the general population, eveningness chronotype was associated with less time spent in physical activity and more time in sedentary behaviors.[43-45]

Studies also reveal that among students with eveningness chronotype, physical activity interventions have little effect on their sleep quality underscoring the importance of chronotype on sleep quality.[45-47] Further, among university students, lack of physical activity was associated with more frequent nightmares disturbing the sleep quality.[48]

Indian literature on smartphone usage among medical undergraduates

Smartphone usage is on the rise among medical undergraduate students of India and causes concern for their physical and mental well-being.[49-52] The prevalence rates of smartphone addiction among Indian medical students are highly variable – studies reporting 34.8% to 52%,[53-57] possibly due to variations in assessment tools employed to elicit smartphone addiction. Smartphone addiction is more prevalent among boys than girls[53] while other studies report a higher prevalence among female students than male counterparts.[58]

Low levels of emotional stability were associated with developing smartphone addiction among medical students,[57] and smartphone addiction is often associated with higher levels of perceived stress.[54,59]

Smartphone overuse and addiction are associated with poor sleep quality[50,53,56,60] and reduced physical activity.[55] Although various studies have highlighted the relationships between sleep quality, academic performance, and smartphone addiction, studies reporting the interplay between emotional regulation, chronotype, physical activity, and smartphone addiction among medical undergraduates are rare, especially in India.

Hence, the present study aimed to determine the prevalence of smartphone addiction among medical undergraduates of a medical college in Southern India. We also aimed to explore the relationship between chronotypes, emotional regulation, physical activity levels, and smartphone addiction.

METHODS

Study design, setting, and population

The present study was a cross-sectional observational study conducted among various batches of medical undergraduate students at a medical college in Southern India. Medical undergraduate students, aged 18 years and above, of any gender, with possession and usage of smartphone were recruited for the study. Medical undergraduate students who were studying in the MBBS program

at any year (I/II/III/final/internship) comprised the study population. Students were excluded if they had a known diagnosis of any psychiatric illness or sleep disorder and currently on medications or any form of therapy in the past 3 months. The study was conducted as a nonfunded short-term student research project over a period of 3 months (November 2024 to January 2025).

Sample size calculation, sampling technique, and recruitment

A previously conducted meta-analysis revealed that the prevalence of smartphone addiction among medical undergraduate students was 39%.[1] Based on the prevalence rate, and using the population proportion formula for sample size estimation: $n = ([Z_1 - \alpha/2]^2 \times p \times [1 - p])/d^2$ with $Z_{1-\alpha/2}$=1.96, p = 0.39 and d = 0.07, with the estimated sample size was 187, which was rounded off to 190. Based on the quota sampling method, we required data of 38 students from each batch who had filled the Google Forms (containing the questionnaires). We approached all the medical students across various batches of MBBS program through an E-mail request for their participation in the study. We received a total of 206 responses as follows: first year – 42, second year – 39, third year – 45, final year – 41, and internship – 39. However, after removing incorrect and incomplete data entries (n = 44), a total of 162 students participated in the study [Supplementary Table 1].

Study instruments

Sociodemographic pro forma

The student's gender and academic characteristics (year of study) were recorded in a brief semi-structured pro forma.

Smartphone Addiction Scale-Short Version

The Smartphone Addiction Scale-Short Version (SAS-SV) is a 10-item, 6-point Likert self-report questionnaire designed to assess problematic smartphone use. Participants rate their agreement with statements on daily-life disturbance, withdrawal, overuse, and tolerance. Higher scores indicate greater smartphone addiction. The SAS-SV has been validated across various populations and languages, showing reliability and validity for quick screening and research on smartphone addiction. The cutoff values (males = 31; females = 33) were used to diagnose "smartphone addiction" in our sample.[61]

Reduced Morningness-Eveningness Questionnaire

The Reduced Morningness-Eveningness Questionnaire[62] is a 5-item questionnaire used to assess a person's chronotype. These questions typically cover preferred wake-up time, how tired one feels in the morning, preferred time for peak performance, and self-assessment as a morning or evening type. Each of the five questions has a set of response options with assigned numerical scores. By summing the scores for all five questions, a total score is obtained. This total score indicates the individual's chronotype. The cutoffs for chronotype were as follows: evening type: <12, neutral type: 12–17, and morning type: >17. Thus, a higher score implies greater "morningness" chronotype in the individual.

Emotion Regulation Questionnaire

The Emotion Regulation Questionnaire (ERQ) is a 10-item self-report scale designed to measure emotion regulation strategies: cognitive reappraisal and expressive suppression.[63] Cognitive reappraisal is a proactive, antecedent-focused strategy involving changing thoughts about a situation to alter its emotional impact. Expressive suppression, in contrast, is a reactive, response-focused strategy that involves inhibiting the outward display of emotions. The questionnaire has consistently demonstrated strong psychometric properties across diverse samples and cultures.

International Physical Activity Questionnaire-Short Form

The International Physical Activity Questionnaire-Short Form (IPAQ-SF) is a brief self-report tool used to assess physical activity levels across various domains (work, transport, household chores, and leisure time) and intensities (vigorous, moderate, and walking) over the past 7 days, as well as time spent sitting.[64] Its primary purpose is for population surveillance of physical activity and for obtaining internationally comparable data, making it useful in epidemiological studies and health research. The IPAQ-SF consists of seven core questions and generates data that can be reported as continuous measures (MET-minutes/week) or categorized into low, moderate, and high physical activity levels based on established scoring protocols.

Study procedure

The primary investigator (PI) acquired the contact E-mail addresses of the study participants from the college authorities after ethical clearance for the study. Both male and female students were recruited as study participants after fulfilling the selection criteria. The investigator refrained from obtaining further information such as name, unique ID, or any other personal identity of the study participants. The PI dispatched the primary E-mail to the study participants, which contained the participants' information sheet and the Google Forms link for the online consent form. Those who consented were presented the forms for questionnaires and the participants were provided the freedom to exit the study at any point. A series of 4 E-mail reminders were sent every week for a period of 1 month except for those who marked "no" for willingness to participate in the study. Smartphone addiction severity, chronotype, emotional regulation, and physical activity were assessed using the Smartphone Addiction Scale (SAS) Scale, Morningness-Eveningness Questionnaire, ERQ, and IPAQ, respectively. The responses of the participants were kept confidential. The study was carried out after obtaining Institutional Ethics Committee clearance (MGMCRI/2024/01/03/IHEC/34/2024/01/03/IHEC/34), and online informed consent was obtained from all study participants.

Statistical analysis

The data were collected through Google Forms and recorded through MS Excel (Version 2019). The statistical analysis was done using IBM Corp. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.; 2012. Means and standard deviations were used to represent quantitative variables, and frequency and percentages were used to represent qualitative variables. Inferential analyses (independent t-test, Mann–Whitney U, Kruskal–Wallis, Chi-square test, and Pearson's correlation coefficient test) were performed to find the association between chronotypes, emotional regulation domain scores, physical activity levels (measured as METS-minutes/week using the IPAQ scoring protocol), and smartphone addiction severity. Subgroup analyses were carried out among the various batches of medical students. $P < 0.05$ was considered statistically significant.

RESULTS

Sample characteristics

The present study included 162 medical undergraduate students from a medical college taken across all the 5 years of medical school (1st year, 2nd year, 3rd year, final year, and medical internship) [Supplementary Table 1].

Prevalence of smartphone addiction among the sample and across the batches of medical students

Of the total sample, smartphone addiction (as per SAS-SV gender-specific cutoff scores) was present in 85 students (52.5% of the sample), and the rest did not qualify for smartphone addiction. We compared the scores of SAS-SV across the five groups of medical students and found that there were no statistical differences between the five groups based on their smartphone usage [Supplementary Table 2].

Association between smartphone addiction severity and chronotypes among medical undergraduate students

The present study found that the proportion of students with smartphone addiction was higher among those with evening chronotypes ("night owls") when compared to morning chronotypes ("larks"). The difference was statistically significant with a moderate-to-high effect size (Cramer's $V = 0.30$ and Cohen's $d = 0.60$) [Table 1].

Association between smartphone addiction severity and emotional regulation among medical undergraduate students

The domain scores of emotional regulation were not statistically different between students with smartphone addiction and those without smartphone addiction [Table 2].

Association between smartphone addiction severity and physical activity levels among medical undergraduate students

The physical activity level scores were computed as METS-minutes per week according to the type of physical activity the students were involved. We found that students with smartphone addiction had reduced levels of physical activity (as revealed by lower METS-minutes) than those without smartphone addiction [Table 3].

Directional relationships between chronotype, emotional regulation, physical activity, and smartphone usage

When the relationship between smartphone usage and other variables such as chronotype, emotional regulation, and physical activity levels

Table 1: Association between smartphone addiction severity and chronotypes among medical undergraduate students (*n*=162)

Chronotype	Entire sample (*n*=162), *n* (%)	Smartphone addiction		Test characteristic (*P*)	Effect size
		Present (*n*=85), frequency (%)	Absent (*n*=77), frequency (%)		
Morning type	55 (34)	20 (23.5)	35 (45.5)	χ^2=14.888	Cramer's
Neutral type	74 (45.7)	39 (45.9)	35 (45.5)	(<0.001)*	*V*=0.303
Evening type	33 (20.3)	26 (30.6)	7 (9)		
RMEQ total score, mean±SD	15.27±4.13	14.00±4.01	16.68±3.82	*t*=−4.336 (<0.001)*	Cohen's *d*=0.6

*$P<0.05$, statistically significant. RMEQ: Reduced Morningness-Eveningness Questionnaire, SD: Standard deviation

Table 2: Association between smartphone addiction severity and emotional regulation among medical undergraduate students (*n*=162)

Emotional regulation domain	Entire sample (*n*=162)	Smartphone addiction		Test characteristic (*P*)	Effect size
		Present (*n*=85), mean±SD	Absent (*n*=77), mean±SD		
Cognitive appraisal	28.41±6.13	28.07±6.16	28.79±6.11	*t*=−0.747 (0.45)	NA
Expressive suppression	17.64±4.82	17.60±4.79	17.68±4.88	*t*=−0.099 (0.92)	

SD: Standard deviation, NA: Effect size not applicable

Table 3: Association between smartphone addiction severity and physical activity levels among medical undergraduate students (*n*=162)

Level of physical activity (in METS-min/week)	Entire sample (*n*=162)	Smartphone addiction		Test characteristic (*P*)
		Present (*n*=85), median (IQR)	Absent (*n*=77), median (IQR)	
Walking	693 (231–1386)	462 (198–1039)	792 (231–2079)	*U*=2521.5 (0.01)*
Moderate	480 (0–915)	240 (0–780)	480 (190–960)	*U*=2702 (0.05)*
Vigorous	480 (0–1530)	120 (0–1020)	960 (0–2400)	*U*=2325 (<0.001)*
Total	2310 (833.25–4465.5)	1386 (685.5–3230.25)	3273 (1314–5068.5)	*U*=2212.5 (<0.001)*

*$P\leq0.05$, statistically significant. METS: Metabolic equivalents, IQR: Interquartile range

Table 4: Correlation between smartphone addiction severity, chronotype, emotional regulation, and physical activity level scores among the medical undergraduate students (*n*=162) using Pearson's Correlation test

Variable	SAS-SV total score	RMEQ total score	Cognitive appraisal of ERQ	Expressive suppression of ERQ	IPAQ total score
SAS-SV total score	-	−0.247 (0.002)*	−0.104 (0.189)	−0.015 (0.85)	−0.151 (0.05)*
RMEQ total score	−0.247 (0.002)*	-	0.091 (0.25)	−0.115 (0.145)	0.113 (0.152)
Cognitive appraisal of ERQ	−0.104 (0.189)	0.091 (0.25)	-	ND	0.110 (0.16)
Expressive suppression of ERQ	−0.015 (0.85)	−0.115 (0.145)	ND	-	0.118 (0.13)
IPAQ total score	−0.151 (0.05)*	0.113 (0.152)	0.110 (0.16)	0.118 (0.13)	-

*$P\leq0.05$, statistically significant. SAS-SV: Smartphone Addiction Scale-Short Version, RMEQ: Reduced Morningness-Eveningness Questionnaire, ERQ: Emotion Regulation Questionnaire, IPAQ: International Physical Activity Questionnaire, ND: Not done as they are subscales of ERQ

was analyzed, results revealed significant relationships between chronotypes, physical activity levels, and smartphone addiction. Increasing severity of smartphone addiction was associated with increased likelihood of eveningness chronotype ($r = -0.247$, $P = 0.002$). Similarly, increasing levels of smartphone addiction were associated with less amounts of total physical activity per week ($r = -0.151$, $P = 0.05$) [Table 4].

DISCUSSION

The present study attempted to explore the prevalence and correlates of smartphone addiction among medical undergraduates of a tertiary care teaching hospital of Puducherry, India. The study also explored for possible associations between chronotype, emotional regulation, physical activity, and smartphone addiction.

Prevalence of smartphone addiction

A total of 162 medical undergraduate students participated in the study with approximately equal representation from all the 5 years of MBBS program (1st year, 2nd year, 3rd year, final year, and medical internship). Smartphone addiction was present in 52.5% of medical students in our sample. The high prevalence of SMA in our sample is similar to some of the studies conducted among Indian medical students.[53,55,65]

Smartphone addiction and chronotype

The present study revealed that a higher proportion of students with smartphone addiction had "eveningness" chronotype than students without smartphone addiction. In addition, we found that increasing degrees of smartphone usage were more likely to be associated with "eveningness" biological rhythm among medical undergraduates. Such findings reiterate findings from previous studies where medical students with smartphone addiction spent more time awake at night and had reported somnolence or fatigue in the daytime.[10,11,23] The short wavelengths (blue light) emanated from smartphone devices are believed to be associated with circadian rhythm abnormalities leading to alteration in chronotypes.[66]

Smartphone addiction and emotional regulation

We found no association between smartphone addiction and emotional regulation among medical undergraduates. This is in contrast to studies identifying positive associations between negative emotional states and smartphone addiction.[31,54,59] The lack of association between smartphone addiction and emotional regulation in our sample of medical undergraduates indicates that there could be possible buffering mechanisms such as psychological capital, coping mechanisms, self-compassion, and positive social support leading to better emotional regulation among medical students despite having smartphone addiction.[28,67,68]

Smartphone addiction and physical activity

In our study, we found that smartphone addiction had an inverse relationship with physical activity. Students without smartphone addiction had better engagement in a wide range of physical activities than those with smartphone addiction. Our findings add to the Indian literature regarding smartphone addiction and reduced levels of physical activity.[55] A recent systematic review supports our findings that physical activity can lead to beneficial effects on smartphone addiction by reducing its severity.[69]

Strengths and limitations

The study is one of the first to assess various parameters related to smartphone usage across all batches of medical undergraduates in Indian settings. However, the present study has the following limitations: limited sample size for the secondary objectives, responder bias, potential selection bias, cross-sectional study design, and employment of subjective assessment methods in assessing outcome measures.

CONCLUSION

Smartphone addiction was found in more than 50% of medical undergraduates. The majority of individuals with smartphone addiction belonged to eveningness chronotype. The physical activity levels lower among undergraduates with smartphone addiction. Those individuals with eveningness chronotype and lower physical activity levels experienced a severe level of smartphone addiction.

The study findings suggest that screening should be specifically targeted toward students exhibiting the eveningness chronotype and those with low physical activity, as the combination of these two factors significantly exacerbates the severity of addiction. Consequently, effective, multi-modal intervention programs should focus not only on regulating smartphone use but also on implementing strategies to shift the eveningness chronotype and incorporating increased physical activity to address the synergistic risks identified in this high-risk population.

Author contributions

AS - Data collection, Methodology, Writing- review and editing. KG - Conceptualization, Methodology, Writing- review and editing. VC - Data curation, Methodology, Formal analysis. SP - Data curation, Methodology, writing review. KS - Conceptualization, Methodology, Formal analysis, Writing-original draft. MV- Data curation, Methodology.

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Conflicts of interest

There are no conflicts of interest.

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Original Article

Beyond distress: Reasons for endurance in caregiving among spouses of persons with severe mental illness: An Indian study

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Abstract

Background: Spouses of persons with severe mental illness (SMI) would undergo distress because of the long-term caring demands, which lead to numerous difficulties and challenges, causing distress. In spite of this, many spouses in India would continue to care person with SMI. This research aims to capture the reasons contributing to enduring caregiving despite distress experienced by spouses of persons with SMI.

Materials and Methods: Seventy-five spouses living with and caring for a person with SMI were recruited using purposive sampling techniques for a cross-sectional mixed-methods study. Distress among spouses was assessed using Kessler's distress scale. Descriptive statistics were used to analyze the levels of distress among spouses. Eighteen distressed spouses who participated in qualitative, in-depth interviews shared their caregiving experiences, which were then examined using thematic analysis.

Results: The study's outcome revealed that 66.7% spouses experienced distress at different levels (mild, moderate and severe). Qualitative analysis revealed four main reasons for enduring caregiving: a sense of bonded duty, acceptance of one's destiny, collective support, unwavering love and loyalty.

Conclusion: This study showed that spouses in India are not only driven by emotional attachment but are also significantly influenced by Indian values, culture, religious beliefs, and marital commitment, which highlights both duty and sacrifice.

Keywords: Caregiving, distress, severe mental illness, spouse

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INTRODUCTION

Schizophrenia and bipolar disorder are severe mental illnesses (SMIs), which are chronic in nature, causing serious disturbance in a person's cognitive, emotional and social functioning, not only leading to long-term personal disability but also demanding ongoing care from families, causing burden, especially for spouses.[1-5]

Unlike the western context of caregiving, where institutional care and a person's autonomy are more emphasized.[6] Caregiving in India is shaped unequally by culture, traditional norms, and values, including collectivism, spirituality, marital values, family responsibilities, and spouses' commitment, which includes sacrifice and emotional endurance.[3,7,8]

Spouses of persons with SMI, often called "hidden patients," would undergo difficulties such as managing symptoms, balancing finances, poor support, family dysfunction, and emotional struggles while witnessing their partner's symptoms.[9-11] In addition, these spouses will be more concerned about their children and their future.[12] It is well established in the literature that these struggles have often led to caregiving burden and distress among spouses of persons with SMI.[13-15]

While distress among spouses and caregivers is well-documented.[16,17] Very little is known about the reasons why spouses in the Indian context continue caregiving despite distress. Therefore, this study aims to explore reasons for endurance in caregiving among distressed spouses of persons with SMI.

MATERIALS AND METHODS

This study employed mixed-methods (QUAN + QUAL) research design, which forms part of the main PhD research, and explored

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the reasons for endurance in caregiving among distressed spouses of persons with SMI. Both qualitative and quantitative data were collected simultaneously from spouses caring for persons with bipolar affective disorder (BPAD) or schizophrenia/psychosis not otherwise specified (NOS) for more than 2 years, recruited purposively from a tertiary care hospital (November 2023 to May 2024). The study recruited 75 participants, estimated based on the mean (17.08) and Standard Deviation (7.08) of the caregiver study, considering a detectable difference of 2.3 points with 95% confidence and 80% power.[18] In addition, 18 distressed spouses (10 female and 8 male) were recruited for a qualitative study to capture reasons for endurance in caregiving for persons with SMI. Written informed consent was obtained from each participant, and ethical approval was granted by NIMHANS, Bengaluru. This study adhered to the STROBE guidelines for reporting.[19]

Tools

Quantitative data were collected using a sociodemographic sheet for spouses and the Kessler's Distress Scale to understand their psychological distress. This scale is a 10-item scale that rules out current (1 month) distress severity levels related to emotional symptoms. The total score of this scale was divided into levels, with a score of <20 indicating no distress, 20–24 signifying mild distress, 25–29 indicating moderate distress, and 30–50 signifying severe distress, which will be analyzed categorically.[20] For cultural equivalence, the scale was translated into the Kannada language and back-translated. A content validation was then conducted by three experts. This tool has been validated in India and has a Cronbach's alpha coefficient ranging from 0.80 to 0.93.[21]

For a qualitative study, a semi-structured interview guide was employed to analyse spouses' caregiving experiences and reasons contributing to their enduring caregiving role. In this guide, prompts were used to assess experiences of distress, caring experiences, reasons for caring despite worries, coping, and support systems. To confirm its cultural and contextual relevance, this guide was face validated by five experts, who further reviewed it for linguistic clarity.

Analysis

Quantitative analysis

Descriptive statistics, including frequencies, means, and standard deviation, were used to assess the sociodemographic profile and levels of psychological distress among spouses. IBM SPSS 20 version was used to carry out the analysis.

Qualitative analysis

The thematic framework developed by Braun and Clarke was used to capture caregiving experiences and reasons contributing to enduring caregiving.[22] Initially, recorded data were transcribed, and it was reviewed by five experts to confirm its clarity, quality, and completeness. Following this entire transcript was translated from Kannada to the English language for further analysis. Upon being familiarized with the narratives, codes were generated, and all these codes were systematically organized into subthemes and themes based on recurring patterns. Finally, a total of four themes emerged from the analysis.

RESULTS

Qualitative data analysis

Profile of spouses of a person with severe mental illness

The mean age of spouses was 39.80 years, with a standard deviation of 5.05. More than half (64%) of respondents were female spouses. Nearly one-half (46%) had completed high school. Thirty-six percent of spouses were engaged in business activities, followed by homemakers (25.3%), and salaried individuals (13.4%), with daily wage laborers making up the remaining 25.3%. 74.7% belonged to nuclear families. The mean duration of marriage among spouses was 18.34 years, with a standard deviation of 5.89, ranging from 9 to 30 years. The mean annual family income was 90,813 rupees with a standard deviation of 46,947.55, ranging from 10,000 to 216,000 rupees. The majority, 60%, had more than one child [Table 1].

Profile of a person with severe mental illness

The mean age of ill partners was 41.05 years, with a standard deviation of 8.05, with a majority (64%) being male. Thirty-six percent had completed their high school education, and over 28% were homemakers, followed by unemployed (25%) and salaried (21.3%). Very few were businesspeople (14.7%) and daily wage labourers (10.7%).

More than half (56%) were diagnosed with BPAD, whereas 44% had Schizophrenia or Psychosis NOS. 58.7% reported improvement, whereas the remaining 41.3% were symptomatic. The mean scores for illness duration and treatment duration were 11.64 and 10.22, respectively, with standard deviations of 7.86 and 7.05. Notably, a high proportion of ill persons (82.7%) were engaged in regular follow-up care, indicating good adherence to mental health treatment [Table 2].

Distress level among spouses of persons with severe mental illness

The study showed that, out of 75 spouses, 28.80% had severe distress, 25% had mild distress, and 13.3% had moderate distress. This indicated that more than half ($n = 50$) of the spouses were experiencing

Table 1: Respondents' sociodemographic details

Variable	Categories	Frequency (%)
Age	Mean±SD (range)	39.80±5.05 (28.00–50.00)
Gender	Male	27 (36)
	Female	48 (64)
Education	Illiterate	9 (12)
	Higher primary	12 (16)
	High school	35 (46.7)
	College education	19 (25.3)
Employment	Salary	19 (25.3)
	Business	27 (36.0)
	Daily wage	10 (13.3)
	Homemaker	19 (25.3)
Family type	Nuclear	56 (74.7)
	Joint family	19 (25.3)
Couple's year of marriage	Mean±SD (range)	18.34±5.89 (7.00–30.00)
Family annual income in rupees	Mean±SD (range)	90,813±46,947.55 (10,000–216,000)
The number of children a couple had	Couples with one child	30 (40)
	Couples with two children	45 (60)

SD: Standard deviation

Table 2: Profile of a person with severe mental illness (*n*=75)

Variable	Categories	Frequency (%)
Age (years)	Mean±SD (range)	41.05±8.05 (24.00–59.00)
Gender	Male	48 (64.00)
	Female	27 (36.00)
Education	Illiterate	17 (22.7)
	Higher primary	13 (17.3)
	High school	27 (36.0)
	College education	18 (24)
Employment	Salary	16 (21.3)
	Business	11 (14.7)
	Daily wages	8 (10.7)
	Homemaker	21 (28.0)
	Unemployed	19 (25.3)
Illness types	Schizophrenia	33 (44.00)
	BPAD	42 (56.00)
Current clinical condition	Improved	44 (58.7)
	Symptomatic	31 (41.3)
Illness duration years	Mean±SD (range)	11.64±7.86 (1.00–30.00)
Treatment duration years	Mean±SD (range)	10.22±7.05 (1.00–30.00)
Regular follow-up`	Yes	62 (82.7)
	No	13 (17.3)

SD: Standard deviation, BPAD: Bipolar affective disorder

Table 3: Distress level among spouses of persons with severe mental illness

Distress level	Frequency (%)
No distress (10–19)	25 (33.3)
Mild distress (20–24)	19 (25.3)
Moderate distress (25–29)	10 (13.3)
Severe distress (30–50)	21 (28.80)

distress at different levels (combined mild, moderate, and severe levels). Whereas the remaining 33.3% showed no distress [Table 3].

Thematic analysis of qualitative data

Qualitative interviews elicited information about the reasons for spouses enduring caregiving despite personal difficulties. Eighteen spouses out of 50 samples who showed distress were further interviewed. Some of the predominant questions were "how do you feel about caring for your spouses," "why do you care for your partner despite challenges," and "how do you manage challenges." Analysis generated major themes, including a bond by duty, accepting one's destiny, collective support and love, and loyalty.

Bonded by duty

For spouses, caregiving is implicated in a strong sense of lifelong marital obligations, where caring was viewed as a nonnegotiable, culturally assigned responsibility, despite limited support or personal challenges.

One spouse, who had cared for her husband with schizophrenia for 10 years, reflected on why she chose to continue caregiving despite the challenges.

"As a wife and a mother, it is my responsibility to stay with him. I cannot leave my husband; what will I tell my children? My parents married us, and now it's my duty to respect them by staying with my husband." (F 3)

Similarly, male spouses described that obligation to care in spite of challenges, was rooted in a sense of moral duty, he says, *"She is my wife, even if she is not well, I will look after her. (M 2)"*

This narrative portrayed caregiving as a bonded duty, the strongest reason to sustain spouses' caregiving. This demonstrated how family and relationshi*P* values and personal beliefs enabled continuity in caring despite financial and psychological difficulties.

Accepting the once destiny

Spouses found the endurance in caregiving through the belief that their situation was meant to be or given by God. Instead of blaming themselves or avoiding the challenges, spouses accepted caring as their life destiny. One female spouse told.

"I felt God has given me this life, in my entire life, I have to look after him. I know it will not be that easy, but I feel God wants this from me. Now I don't have a choice, I have to follow what god wants from me."

One female spouse accepted her caregiving duty by showing gratitude towards God, perceiving their husband's survival as God's will.

"I would have lost my husband a long time ago when he attempted suicide, but he survived. I always feel God answered my prayer. Since then, I have stopped complaining about my problem. I have accepted that this is our life. God will look after me and my family."

Spouses viewed caregiving as a life's destiny, and through faith, mental adjustment, gratitude, and adaptive coping, they were enabled to continue caregiving despite distress.

Collective support

Spouses reported receiving support from family, community and institutions, which helped them to manage their daily challenges and parenting responsibilities, highlighting that caregiving endurance was shared rather than merely personal.

One female explained, *"My husband has to visit the hospital every three months. Doctors change our medicines whenever we visit, and I find it difficult to buy them as I don't have a steady income. So, I ask my brother to take my husband to the hospital when he is very ill, and my brother will look after the expenses. I alone cannot manage all this." (F 03)*

Male spouses said, *"I have to look after my business. I have a small shop, and I have to close it when she is ill, which I inform my neighbors about, and then go. My neighbor's daughter would contact me if there were any emergencies." (M2)*

Another Male spouse described how the institution setup helped them in caring for *"my younger son studied in the 4th std. When I go out for work, my wife used to help him with his homework. However, after she became ill, she was no longer bothered by his homework and exams, so I placed him in a hostel. My elder daughter is at my mother's house in my neighborhood. I visit them whenever I have the time. Both are studying well."*

These narratives demonstrate how support from extended families, community, and institutional care assisted spouses in managing parenting responsibilities while caring for persons with SMI. By entrusting caregiving and parenting roles to others, spouses were able to reduce burden and sustain responsibilities more effectively. All this support was received through financial assistance, shared presence and parenting subsidy.

Unwavering love and loyalty

Many spouses described caring for their partners as not only a duty, but an extension of love or a way of showing their emotional connection. In many cases, love was entwined with loyalty, which was built over time through shared life experiences and a sense of gratitude for how the ill person had looked after them in the past.

One female spouse expressed that *"It is difficult to live without my husband. He is just like my best friend. When he is not ill, I feel relaxed and happy to talk to him. I share everything with him."*

Another expressed how their partners were emotionally important to these spouses, saying, *"I love my husband very much, I know he loves me a lot, he is behaving like this because of his illness. I can understand it. In fact, when I was ill, he had taken care of me better than my parents."*

Despite caregiving difficulties and distress reported by these spouses, they expressed emotional closeness and attachment to their partners with SMI, describing a bond that remained unaffected by the mental illness and was rooted in a lasting connection beyond a formal marital relationship.

"Before marriage, my husband had many proposals. He could have chosen a rich woman, but he chose me. He had taken care of me when he was alright, in fact, when he was offered a second marriage, he rejected it and stood by me. I will stay with him no matter how hard it is to take care of him."

Another said, *"Even if she is not well, she takes care of my children and me, how will I leave her now. Since marriage, I had noticed she did a lot for my family, now it's my turn to support her. It would be difficult for me to leave her in this condition."*

This verbatim showed emotional reciprocity beyond responsibilities, rooted in gratitude and affection for the care and love they had received from them before the illness.

DISCUSSION

This study used a mixed-method design to assess the psychological distress levels of spouses using a standardized tool, and through in-depth interviews, this study captures the reasons for enduring caregiving despite distress among spouses of persons with SMI. This combined design showed a comprehensive picture that captures the level of distress and reasons for endurance in caregiving practices among spouses.

This study showed the majority of spouses had experienced psychological distress at different levels (mild, moderate and severe). This outcome supports the long-lasting evidence that spouses of persons with SMI often experience high burden and strain that leads to emotional exhaustion and fatigue.[13,23-25] However, what stands out in the present study is that, despite distress, spouses continue to provide care. Studies from India have constantly reported that caregiving is sustained over longer periods, even in the face of high stress.[26,27] Whereas Western studies capture different patterns, as prolonged burden and stress, which would lead to release from institutional care, separation, and withdrawal.[28]

Furthermore, this study provided a deeper understanding of the reasons that contributed to the enduring nature of caregiving practices, which helped them navigate their role both emotionally and practically, despite experiencing distress. Primarily, spouses considered caregiving for their ill partners as their bonded duty or cultural obligation. This can be attributed to the sociocultural understanding of the Indian marriage system, which is shaped by collectivist values and obligations, which is not merely a personal union but a socio contract.[29] Mishra *et al*. note that in India, caregivers often set their role through a sense of duty, which is sustained by community reinforcement and family values.[30] Walsh showed family resilience, often expressed through shared family responsibilities and role performance.[31] The purpose of spouses' caregiving is further highlighted in traditional scripts, which are connected to the concept called "dharma," also referred to as a duty, which can provide a mandated moral explanation for enduring caregiving distress.[32] The spouses in this study perceived their caregiving role as "plan of god" or just "meant to be," indicating the pattern of coping strategies developed to overcome the burden by reframing these challenges into a life purpose. This kind of reformed adaptation allows spouses to normalize their current situation and find meaning in their suffering. These findings align with the research by Rammohan *et al*. and Gojer *et al*., who reported that caregivers in India often rely on spiritual and religious practices to cope with life's challenges.[33,34] Similarly, Pargament and Abu Raiya emphasized that religious-based thinking fosters emotional endurance by helping the individual reframe adversity in a spiritually coherent manner.[35] Recently, Malhotra and Thapa found that caregivers of persons with SMI commonly used religious narratives as part of coping. They interpreted the process of caregiving as a divine plan and a karmic lesson, which helped them resolve the emotional demands of caregiving.[36]

A larger support system is found to be one of the primary reasons for spouses in India to endure caregiving practices. Indian society is known for its collective nature, with responsibilities being shared by extended families and a closed outside network. Such collective support helps spouses to combat caregiving challenges. These outcomes have been echoed in the current literature. Zhong *et al*. (2020) have found that spouses become less depressed when they receive sufficient support from their extended families.[37] Similarly, a qualitative study by Revenson *et al.* (1991) found that a closed network, such as neighbors and known people outside the family, commonly provided help during a family crisis and served as a source of stress buffers.[38]

Many participants expressed that caregiving was part of the love and attachment they had developed over time, living with the person. This attachment may get stronger as spouses feel a greater need to protect by remaining available to the ill person. This was observed by Feeney and Hohaus (2001), who suggested that attachment and caregiving practices were interrelated in the nature of the emotional bond, where a strong willingness to care was predicted from stronger attachment with the ill person.[39] Moreover, studies have shown that an emotionally protected relationship motivates caregiving as an expression of commitment and love, even during the presence of significant illness.[40,41]

Strengths and limitations

The key aspects of this unique study are its mixed-method design, which showed a comprehensive understanding of spouses' caregiving experiences. While the quantitative study assessed the levels of distress, the qualitative narrative provided a deeper understanding of the reasons behind spouses' endurance in caregiving for persons with SMI, including the cultural, emotional and religious meanings attached to it. This study is strengthened by its significance to Indian culture, with themes such as collective support, spiritual destiny, and bonded duty representing collectivistic values which are often underrepresented in worldwide studies. Nevertheless, this finding has limited generalizability to other religions and populations. Gender differences were observed, with females openly expressing emotions more than their male counterparts. Moreover, this cross-sectional design would limit its ability to detect changes in distress and resilience over time.

Recommendation

The study findings recommend that support services extend beyond conventional caregiving approaches by utilizing cultural strengths, encouraging family-based shared caregiving and initiating culturally adapted psychotherapy that includes traditional and marital roles. Upcoming research should focus on adaptation and resilience rather than just distress and burden, to better support spouses in sustaining caregiving despite difficulties they experience.

CONCLUSION

Distress among spouses of persons with SMI is universal, caregiving endurance in India is strongly shaped by spiritual beliefs, cultural values, marital commitment, and sense of duty and sacrifices. This is further enabled by a collectivistic family system and community support, which distinguishes it in the Indian context from the Western individual approach.

Author contributions

PB and JN conceptualised the research work. PB collected data and reviewed articles. JN, KTR, and PB were involved in planning and analysing the data. PB drafted the manuscript, and JN and KTR provided corrections and feedback. All authors have reviewed the manuscript and agreed to publish the current version of the manuscript.

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Conflicts of interest

There are no conflicts of interest.

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Original Article

Study of dispositional mindfulness, life satisfaction, and the mediating role of self esteem among students

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Abstract

Background: Dispositional mindfulness, the ability to stay present and aware in the moment, has been shown to enhance self-esteem, which in turn, positively impacts life satisfaction, which is a subjective evaluation of one's quality of life.

Aim: This study explores the relationship between dispositional mindfulness, life satisfaction, and the mediating role of self-esteem.

Materials and Methods: A sample of 200 university students aged 18–25 years participated in the study, measured using the Mindful Attention Awareness Scale (MAAS), State of Self-Esteem Scale, and Satisfaction with Life Scale. Pearson's correlation and mediation analysis using PROCESS Model 4 were conducted.

Results: The significant positive correlations were found between mindfulness, self-esteem, and life satisfaction. Mediation analysis showed that self-esteem significantly mediated the relationship between mindfulness and life satisfaction.

Conclusion: Mindfulness enhances life satisfaction through self-esteem, emphasizing the importance of self-esteem in this relationship.

Keywords: Life satisfaction, mindfulness, self-esteem

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INTRODUCTION

In today's fast-paced academic environment, university students face mounting psychological challenges influenced by academic demands, financial concerns, and social expectations.[1,2] These stressors often lead to anxiety, depression, and reduced well-being, underscoring the need for effective coping mechanisms.[3] One such factor gaining empirical attention is dispositional mindfulness, the inherent tendency to remain aware and attentive to present experiences.[4] Unlike learned mindfulness practices, dispositional mindfulness is considered a stable psychological trait[5] and is linked to emotional regulation and psychological resilience.[6,7]

Life satisfaction, a cognitive evaluation of overall well-being, is critical to students' academic success, personal development, and social functioning.[8,9] Studies suggest that life satisfaction is influenced by both internal traits and external stressors,[9,10] and enhancing it can promote motivation, adaptability, and mental health.[11,12]

Emerging research highlights self-esteem as a potential mediator in the relationship between mindfulness and life satisfaction.[13,14] Self-esteem, defined as an individual's evaluation of their own worth,[15] is positively associated with both mindfulness and subjective well-being. Mindfulness may foster self-esteem by encouraging non-judgmental self-awareness and reducing negative rumination.[16] In turn, higher self-esteem enhances self-worth and life satisfaction.[14] Despite these associations, the mechanisms by which self-esteem mediates this relationship remain underexplored, particularly in student populations.[17,18]

This study aims to explore the relationship between dispositional mindfulness, self-esteem, and life satisfaction among university students. Specifically, it investigates (a) mean differences in these variables and (b) whether self-esteem mediates the link between mindfulness and life satisfaction. By clarifying this pathway, the study contributes to a deeper understanding of how mindfulness-based approaches may promote well-being and academic adjustment. Given the growing emphasis on positive psychology and mental

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health interventions, this research offers timely insights with practical implications for student-focused mental health programs.[19]

H1: There will be significant differences in the levels of dispositional mindfulness, life satisfaction, and self-esteem among students.

Research has consistently shown variability in dispositional mindfulness, life satisfaction, and self-esteem across different student populations due to factors such as academic stress, sociocultural influences, and individual personality traits. Furthermore, Diener and Diener[20] found that life satisfaction and self-esteem vary greatly depending on psychological and demographic characteristics, which emphasizes the significance of this study in the student population.

H2: There will be a positive relationship between dispositional mindfulness, life satisfaction, and self-esteem among students.

Several studies have demonstrated a positive correlation between mindfulness, life satisfaction, and self-esteem. Keng *et al*.[6] suggested that mindfulness helps to improve individual emotional regulation, which enhances both self-esteem and overall life satisfaction. Similarly, Pepping *et al*.[13] found that mindfulness fosters self-acceptance and reduces negative self-evaluation, thereby improving self-esteem. Furthermore, a study by Wang and Kong[21] established a significant positive relationship between mindfulness and life satisfaction, mediated by self-esteem.

H3: Self-esteem will significantly mediate the relationship between dispositional mindfulness and life satisfaction among students.

The mediating role of self-esteem in the relationship between mindfulness and life satisfaction has been well-documented. Kong *et al*.[22] found that mindfulness positively impacts life satisfaction through the enhancement of self-esteem. This aligns with findings from Shapiro *et al*.[16] who suggested that mindfulness reduces self-criticism and fosters a stable sense of self-worth, which in turn improves life satisfaction.

MATERIALS AND METHODS

Ethical considerations

This study involved no clinical intervention or collection of sensitive personal data and posed minimal risk to participants. As such, formal approval from an institutional ethics committee was not required according to institutional norms.

However, all procedures were conducted in accordance with the ethical standards outlined in the Declaration of Helsinki (WMA, 2000)[23] and international guidelines for research involving human participants. Informed consent was obtained from all participants after clearly explaining the purpose, procedures, voluntary nature, and confidentiality of the study. No identifying information was collected, and participants were assured of their right to withdraw at any stage without any consequences.

Study design

This quantitative, cross-sectional study examined the relationship between dispositional mindfulness, life satisfaction, and the mediating role of self-esteem. Data were collected through validated self-report questionnaires, and analysis included descriptive statistics, *t*-tests, correlation analysis, and mediation analysis.[24,25]

Selection and description of participants

A total of 200 university students aged 18–25 years were selected through convenience sampling. Participation was voluntary. Inclusion criteria included university enrollment and willingness to participate. Students with psychological diagnoses or undergoing treatment were excluded. The sample size was estimated using G*Power 3.1 for mediation analysis, assuming a medium effect size (f^2 = 0.15), 80% power, and α = 0.05, yielding a required sample of 176. To account for possible missing data, the sample was increased to 200.[26,27]

Measurement of tools

The Mindful Attention Awareness Scale (MAAS) was developed by Brown and Ryan.[4] The MAAS measures mindfulness, focusing on present-moment awareness. It consists of a Likert scale ranging from “almost always” to “almost never,” with high internal consistency (Cronbach’s α = 0.92).

The State of Self-Esteem Scale (SSES) was developed by Heatherton and Polivy.[28] The SSES assesses self-esteem fluctuation across three domains: performance, social, and appearance. It includes 20 items rated on a five-point scale (“not at all” to “extremely”), with higher scores indicating greater self-esteem.

The Satisfaction With Life Scale was developed by Diener *et al.*[8] It measures global life satisfaction using a Likert scale from “strongly disagree” to “strongly agree.” It has good reliability (Cronbach’s α = 0.74) and is widely used in well-being research.

Statistical techniques

Data were analyzed using SPSS software (IBM Corp., Armonk, New York, USA).[29] Descriptive statistics summarize demographics and key variables. Pearson’s correlation examined relationships between dispositional mindfulness, self-esteem, and life satisfaction. An independent sample *t*-test assessed gender differences. Mediation analysis, using the PROCESS macro Andrew F. Hayes, The Guilford Press, New York, USA (Model 4; Hayes, 2013) with 5000 bootstrapped resamples, tested self-esteem as a mediator between mindfulness and life satisfaction.[25]

RESULTS AND DISCUSSION

Table 1 depicts the descriptive statistics for mindfulness, life satisfaction, and self-esteem. The sample consisted of 200 participants. The mean score for mindfulness was 52.03 (standard deviation [SD] = 14.31), with scores ranging from 15 to 90.[24] Life satisfaction had a mean score of 20.34 (SD = 6.86), with values ranging from 5 to 35. Self-esteem had a mean of 64.61 (SD = 11.80), with a minimum score of 27 and a maximum of 93.

Table 2 depicts the Pearson’s correlation analysis examining the relationships between mindfulness, life satisfaction, and

Table 1: Descriptive statistics of mindfulness, life satisfaction, and self-esteem

Variable	*n*	Range	Minimum	Maximum	Mean	SD
Mindfulness	200	75	15	90	52.03	14.31
Life satisfaction	200	30	5	35	20.34	6.86
Self-esteem	200	66	27	93	64.61	11.80

SD: Standard deviation

self-esteem. The results indicated a moderate positive correlation between mindfulness and life satisfaction (r = 0.310, P < .001). A stronger positive correlation was found between mindfulness and self-esteem (r = 0.421, P < .001). Additionally, self-esteem and life satisfaction were moderately positively correlated (r = 0.512, P < .001).[30]

The mediation analysis using PROCESS Model 4 confirmed that self-esteem mediates the relationship between dispositional mindfulness and life satisfaction. Mindfulness significantly predicted self-esteem (B = 0.347, SE = 0.053, t [198] = 6.524, P < 0.001), explaining 17.69% of the variance (R^2 = 0.1769, F [1,198] = 42.57, P < 0.001). The overall model predicting life satisfaction was significant (R^2 = 0.2729, F [2,197] =36.98, P < 0.001). Self-esteem significantly predicted life satisfaction (B = 0.269, SE = 0.039, t [197] = 6.917, P < 0.001), while the direct effect of mindfulness on life satisfaction was non-significant (B = 0.055, standard error [SE] = 0.032, t [197] = 1.725, P = 0.086). However, the total effect was significant (B = 0.149, SE = 0.032, t [198] = 4.594, P < 0.001), and the indirect effect through self-esteem was also significant (B = 0.093, BootSE = 0.025, BootLLCI = 0.051, BootULCI = 0.148), confirming mediation [Figure 1 and Table 3].[25]

Below is the mediation model of dispositional mindfulness, life satisfaction, and self-esteem.

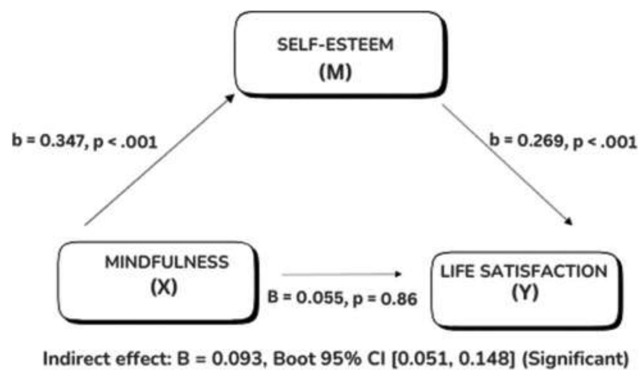

Figure 1: Mediation model shows the relationship between dispositional mindfulness, self-esteem, and life satisfaction

Table 2: Pearson's correlations between mindfulness, life satisfaction, and self-esteem

Variable	Mindfulness	Life satisfaction	Self-esteem
Mindfulness	1	0.310	0.421
Life satisfaction	0.310	1	0.512
Self-esteem	0.421	0.512	1

P<0.01 (one-tailed), (n=200)

DISCUSSION

The present study aimed to explore the relationship between dispositional mindfulness, life satisfaction, and self-esteem among students and investigate the mediating role of self-esteem. The results revealed significant positive correlations among all three variables, consistent with prior research.[4,22] These findings align with the growing literature on the beneficial impact of mindfulness on psychological well-being,[5] particularly in student populations vulnerable to stress due to academic and social pressures.[31]

Correlation analyses showed a moderate positive association between mindfulness and life satisfaction (r = 0.310, P < 0.001), supporting previous studies that identify mindfulness as a key predictor of well-being.[32] A stronger correlation was found between mindfulness and self-esteem (r = 0.421, P < 0.001), indicating that present-moment awareness promotes self-acceptance and a more compassionate self-view.[13,33] Life satisfaction also showed a strong positive association with self-esteem (r = 0.512, P < 0.001), echoing earlier work suggesting self-esteem as a key component of subjective well-being.[20,34]

The mediation analysis further clarified these relationships: mindfulness significantly predicted self-esteem (B = 0.347, P < 0.001), and self-esteem, in turn, predicted life satisfaction (B = 0.269, P < 0.001). However, the direct effect of mindfulness on life satisfaction was nonsignificant (B = 0.055, P = 0.86), suggesting that self-esteem fully mediated this relationship. These findings support existing literature on self-esteem as a key psychological mechanism linking mindfulness to well-being.[35]

The results have important implications for student mental health. Mindfulness-based interventions, such as Mindfulness-Based Stress Reduction, have been shown to reduce negative self-perceptions and enhance emotional regulation, thereby improving self-esteem and life satisfaction.[36,37] Integrating mindfulness training into academic settings may equip students with effective tools to build resilience and enhance psychological well-being.[6,38]

Despite its strengths, the study has limitations. Its cross-sectional design restricts causal interpretation. Future research should use longitudinal or experimental designs to establish the directionality of these relationships. The reliance on self-report measures may also introduce bias; thus, incorporating objective or multi-informant assessments could strengthen the findings. Moreover, examining cultural variations in how mindfulness, self-esteem, and life satisfaction interact could provide a more nuanced understanding.[39]

Table 3: Mediation analysis

Path	B	SE	t	P	95% CI (LLCI, ULCI)
Mindfulness → self-esteem	0.347	0.053	6.524	<0.001	0.242 to 0.451
Self-esteem → life satisfaction	0.269	0.039	6.917	<0.001	0.192 to 0.346
Mindfulness → life satisfaction (total effect)	0.149	0.032	4.594	<0.001	0.085 to 0.213
Mindfulness → life satisfaction (direct effect)	0.055	0.032	1.725	0.086	−0.008 to 0.119
Mindfulness → self-esteem → life satisfaction (indirect effect)	0.093	0.025	-	-	0.051 to 0.148

CI: Confidence interval, SE: Standard error, LLCI: Lower-level CI, ULCI: Upper-level CI

CONCLUSION

The study highlights self-esteem as a critical mediator in the link between mindfulness and life satisfaction among students. These insights underscore the potential of mindfulness-based approaches to support student well-being and call for further exploration across diverse contexts using robust methodologies.

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Conflicts of interest

There are no conflicts of interest.

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Original Article

Electrocardiographic changes in psychiatric patients on antipsychotics: South Indian scenario

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Abstract

Background: ECG abnormalities are highly prevalent among patients on antipsychotics with medication-specific and patient-specific risk-patterns.

Aims and Objectives: This study aims comprehensive ECG analysis to provide region-specific insights into cardiovascular risks associated with antipsychotic use.

Materials and Methods: This cross-sectional study evaluated electrocardiographic(ECG) abnormalities in 101patients receiving antipsychotic medications at a South-Indian tertiary-care-centre.

Results: The results revealed 69%prevalence of ECG abnormalities, with most common alterations being abnormal heart rate(70.3%), prolonged RR (74.3%), TpTe intervals (77.2%), and QTc prolongation(70.3%). Amisulpride showed 75%QTc prolongation incidence, clozapine demonstrated BMI-dependent PR prolongation(r=0.875), and haloperidol universally affected TpTe intervals. Notably, Aripiprazole exhibited unexpected age-dependent conduction changes despite its cardiac-safe reputation. Second-generation antipsychotics(70.3% of prescriptions) showed better safety-profiles than first-generation agents, though polypharmacy(22.8%) amplified risks. Key predictors included age, BMI and lifestyle factors.

Conclusion: These findings advocate for personalized antipsychotic regimens incorporating cardiac-risk assessment and lifestyle interventions to mitigate cardiovascular morbidity in psychiatric populations.

Keywords: Antipsychotics, cardiovascular risk, corrected QT prolongation, electrocardiographic abnormalities, psychiatric patients

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INTRODUCTION

Psychiatric patients, particularly those with severe mental illnesses such as schizophrenia, bipolar disorder, and major depressive disorder (MDD), face a significantly elevated risk of cardiovascular disease (CVD). This contributes to a reduced life expectancy, often 15–20 years shorter than the general population.[1,2] While psychotropic medications are effective in managing psychiatric symptoms, they often lead to adverse metabolic and cardiac effects, including weight gain, dyslipidemia, and electrocardiographic (ECG) abnormalities. Among these, corrected QT (QTc) prolongation, a known precursor to torsades de pointes (TdP) and sudden cardiac death (SCD), has been extensively studied. However, other critical ECG parameters, such as QRS duration, PR interval, T-peak to T-end (TpTe) interval, and heart rate variability, remain underinvestigated, leaving a gap in understanding the full spectrum of antipsychotic-induced cardiac risks.[3-5]

The increased cardiovascular morbidity and mortality in psychiatric patients stem from multiple factors, including medication side effects, poor lifestyle habits (e.g. smoking and sedentary behavior), and systemic healthcare disparities. Psychotropic polypharmacy further complicates this risk, as drug interactions may amplify cardiac abnormalities.[6,7] Despite global awareness of these risks, research has predominantly focused on Western populations, with limited data from low- and middle-income regions like South India, where healthcare access and preventive screening are often

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suboptimal.[8-10] In addition, most studies have examined isolated ECG markers (primarily QTc) rather than a comprehensive assessment of multiple parameters across inpatient and outpatient settings.[11-17]

This study aims to address these gaps by systematically evaluating ECG changes in psychiatric patients receiving antipsychotics in a South Indian tertiary care hospital. By analysing variations in QTc, QRS, PR, and TpTe intervals – along with sociodemographic and clinical correlates – this research will provide region-specific insights into cardiovascular risks associated with antipsychotic use. The findings will inform clinical guidelines for safer psychotropic prescribing and underscore the need for routine ECG monitoring in psychiatric care, particularly in resource-limited settings where cardiovascular comorbidities are frequently overlooked.[18-20]

METHODS

This cross-sectional observational study was conducted at the Department of Psychiatry (Amrita Institute of Medical Sciences), a tertiary care hospital in South India, from January 2023 to December 2025. Participants were recruited consecutively from inpatient wards and outpatient clinics.

Adults (≥18 years) diagnosed with psychiatric disorders as per the International Statistical Classification of Diseases10/11 and receiving antipsychotics for ≥4 weeks were eligible.[21] Exclusion criteria included preexisting cardiac disease, baseline ECG abnormalities, electrolyte disturbances, and concurrent use of other QT-prolonging drugs. 101 patients met the criteria, and consent was taken. Sample size was based on previous research, ensuring >80% power to detect moderate ECG changes at $\alpha = 0.05$.[1]

Primary outcomes were ECG parameters: heart rate, PR interval, QRS duration, QTc (Bazett's), and TpTe interval. Predictors included demographic and clinical variables; potential confounders were polypharmacy, body mass index (BMI), comorbidities, and illness duration.

Data were collected through a semi-structured questionnaire and 12lead ECG (Mortara ELI230). TpTe was measured in lead II or V5. ECGs were interpreted by a blinded physician. Bias was minimized through consecutive recruitment, standardized measurements, and blinded interpretation.

Analysis was performed using Statistical analysis was done using SPSS v20 developed by IBM is an American multinational technology corporation headquartered in Armonk, New York, with operations in over 171 countries. Normality was assessed (Kolmogorov–Smirnov/Shapiro–Wilk). Continuous variables were expressed as mean ± standard deviation or median (interquartile range); categorical variables as frequency (%). Chi-square/Fisher's exact test and Spearman's correlation were used. Missing data (<5%) were handled by listwise deletion; sensitivity checks confirmed results. Significance was set at $P < 0.05$.

RESULTS

A total of 101 psychiatric patients were enrolled in the study [Table 1]. The gender distribution was nearly equal, with 51 females (50.5%) and 50 males (49.5%). The age range spanned from 18 to over 60 years, with the largest proportion in the 18–30 year group (42.6%), followed by those aged above 60 years (20.8%).

Body mass index distribution revealed that almost half of the participants had normal BMI (46.5%), while a considerable number were overweight (42.6%), 9.9% obese, and only one participant (0.99%) underweight [Table 1].

Marital status was evenly divided between married (48.5%) and unmarried (46.5%) individuals, with smaller proportions divorced/separated (3.9%) or widowed (0.99%). Inpatient admission was more common (60.4%) compared to outpatient care (39.6%), reflecting the severity of illness in many participants. Continuous symptomatology was noted in 74.3% of patients, while episodic symptoms occurred in 25.7%.

Clinical and lifestyle variables are summarized in Table 2. Comorbid illnesses were identified in 42.6% of the sample.

Table 1: Sociodemographic characteristics of study participants (*n*=101)

Parameters	Category	Frequency, *n* (%)
Gender	Male	50 (49.50)
	Female	51 (50.50)
Age group (years)	18–30	43 (42.57)
	30–40	8 (7.92)
	40–50	19 (18.81)
	50–60	10 (9.90)
	>60	21 (20.79)
BMI	Normal weight	47 (46.53)
	Overweight	43 (42.57)
	Obese	10 (9.90)
	Underweight	1 (0.99)
Marital status	Married	49 (48.51)
	Unmarried	47 (46.53)
	Divorced/separated	4 (3.96)
	Widowed	1 (0.99)
Patient status	Inpatient	61 (60.40)
	Outpatient	40 (39.60)
Symptom duration	Continuous	75 (74.26)
	Episodic	26 (25.74)

BMI: Body mass index

Table 2: Clinical and lifestyle characteristics of study participants (*n*=101)

Parameters	Category	Frequency, *n* (%)
Comorbid illness	Present	43 (42.57)
	Absent	58 (57.43)
Recent aggression	Present	29 (28.71)
	Absent	72 (71.29)
Diet	Nonvegetarian	80 (79.21)
	Vegetarian	20 (19.80)
	Vegan	1 (0.99)
Fast food consumption	None	33 (32.67)
	1–2 days/week	35 (34.65)
	3–5 days/week	22 (21.78)
	6–7 days/week	11 (10.89)
Fruit/vegetable intake	None	2 (1.98)
	1–2 days/week	32 (31.68)
	3–5 days/week	28 (27.72)
	6–7 days/week	39 (38.61)
Substance use	Caffeine (yes)	59 (58.42)
	Alcohol (yes)	30 (29.70)
	Smoking (yes)	26 (25.74)

A nonvegetarian diet predominated (79.2%) with a minority following vegetarian (19.8%) or vegan (0.99%) diets. Dietary habits indicated moderate to high fastfood intake in 67.3% of participants. Fruit and vegetable consumption was suboptimal, with only 38.6% reporting daily intake.

Substance use was notable: caffeine use was reported by 58.4%, alcohol by 29.7%, and smoking by 25.7% of participants. These factors have potential relevance to cardiac risk.

Antipsychotic class distribution [Table 3] showed that the majority of participants were on second-generation antipsychotics (SGAs) (70.3%). First-generation antipsychotics (FGAs) were prescribed in 6.9% of cases, while polytherapy accounted for 22.8% (14.9% on multiple SGAs, 7.9% on FGA + SGA combinations).

ECG changes were common [Table 4]. QTc prolongation and abnormal heart rate were each present in 70.3% of patients. Abnormal TpTe interval was the most frequent finding (77.2%), followed by abnormal RR interval (74.3%) and TpTe/QTc ratio (63.4%). QRS complex abnormalities were observed in 30.7%, and PR interval prolongation in 13.9%. T-wave morphological changes were present in 10.9%. Overall, there was no statistically significant difference in ECG abnormalities between patients on FGA, SGA, or polytherapy regimens [Table 5].

Table 3: Distribution of subjects based on class of antipsychotics

Antipsychotics class	Frequency (%)
FGA	7 (6.93)
SGA	71 (70.30)
Poly (SGA)	15 (14.85)
Poly (FGA + SGA)	8 (7.92)

FGA: First-generation antipsychotic,
SGA: Second-generation antipsychotic

Table 4: Electrocardiographic parameters of study participants (*n*=101)

Parameters	Category	Frequency, *n* (%)
ECG parameters	Abnormal heart rate	71 (70.30)
	Abnormal PR interval	14 (13.86)
	Abnormal RR interval	75 (74.26)
	Abnormal TpTe interval	78 (77.23)
	Abnormal TpTe/QT	64 (63.37)
	Abnormal QRS complex	31 (30.69)
	Abnormal QTc interval	71 (70.30)
	Abnormal T-wave	11 (10.89)

ECG: Electrocardiographic, TpTe: T-peak to T-end, QTc: Corrected QT

Table 5: Association between antipsychotics and electrocardiographic changes (overall *P* values)

ECG parameters	*P*
Heart rate	0.31
PR interval	0.69
RR interval	0.30
TpTe interval	0.79
TpTe/QTc	0.58
QRS complex	0.83
T-wave morphology	0.40
QTc interval	0.50

ECG: Electrocardiographic, TpTe: T-peak to T-end, QTc: Corrected QT

Drug-specific observations highlighted particular risks. Haloperidol, amisulpride, and clozapine were most frequently associated with QTc prolongation, TpTe interval changes, and repolarization abnormalities. SGAs such as olanzapine and quetiapine demonstrated QTc prolongation, especially in individuals with repeated hospitalizations. Risperidone showed RR interval changes linked to aggression, TpTe abnormalities associated with frequent symptom episodes, and QRS complex prolongation in longer treatment durations. Aripiprazole demonstrated TpTe changes influenced by age, smoking, and alcohol use. Lurasidone (n = 1) was linked to pronounced QTc and TpTe prolongation. Trifluperazine consistently caused QTc prolongation in patients with chronic illness and polypharmacy.

Significant correlations were identified between ECG parameters and patient demographics [Table 6]. In the FGA group, BMI correlated strongly with QTc prolongation (ρ = 0.811, P = 0.027). In the SGA group, age correlated with PR interval prolongation (ρ = 0.344, P = 0.003) and RR interval changes (ρ = 0.264, P = 0.026).

Polytherapy with multiple SGAs was associated with QRS prolongation correlated with treatment duration [Table 7]. FGA + SGA combinations did not significantly increase ECG abnormalities beyond those seen with monotherapy.

In both SGA and polytherapy groups, treatment duration, number of episodes, and hospitalizations were associated with TpTe and QTc changes, suggesting that the chronic illness course may contribute to cumulative cardiac risk.

Lifestyle habits significantly influenced ECG findings [Table 8]. Smoking was associated with TpTe interval prolongation in SGAs (P = 0.04) and QRS complex changes in both SGAs and polytherapy groups (P = 0.04). Alcohol intake was associated with QRS changes in FGAs (P = 0.04) and SGA polytherapy (P = 0.12, trend). Fastfood consumption was linked to Twave changes in FGAs (P = 0.01) and QRS abnormalities in SGA polytherapy (P = 0.04). Caffeine was linked to T-wave changes in FGAs (P = 0.01).

ECG abnormalities were prevalent in this cohort, particularly QTc and TpTe prolongation [Table 7]. High-risk drugs included haloperidol, amisulpride, and clozapine. Modifiable lifestyle factors such as smoking, alcohol use, and dietary patterns influenced several ECG parameters. Clinical characteristics, including BMI, age, comorbidities, and treatment duration, were significant correlates of cardiac electrical changes. These findings highlight the importance of comprehensive ECG monitoring for psychiatric patients on antipsychotics, with attention to both pharmacological and non-pharmacological risk factors.

DISCUSSION

This comprehensive study evaluated ECG changes in psychiatric patients receiving antipsychotic medications, providing important insights into the cardiac safety profiles of these commonly prescribed drugs. Our findings revealed a 69% prevalence of ECG abnormalities among antipsychotic-treated patients, a rate consistent with previous research by Kinagi and colleagues.[1] The study's methodological strength lies in its comprehensive assessment protocol, which extended beyond conventional QTc interval measurements to

Table 6: Demographic and clinical correlations with electrocardiographic changes (first-generation antipsychotics and second-generation antipsychotics)

Medication class	Parameter	Heart rate (ρ/*P*)	PR interval (ρ/*P*)	RR interval (ρ/*P*)	TpTe interval (ρ/*P*)	TpTe/QTc ratio (ρ/*p*)	QTc interval (ρ/*P*)
FGA	Age	−0.02 (0.951)	0.471 (0.286)	−0.476 (0.281)	−0.007 (0.988)	−0.030 (0.949)	0.237 (0.609)
	BMI	0.295 (0.521)	0.098 (0.834)	0.064 (0.891)	−0.072 (0.879)	−0.108 (0.817)	0.811 (0.027)
SGA	Age	−0.18 (0.119)	0.344 (0.003)	0.264 (0.026)	−0.133 (0.270)	−0.173 (0.149)	0.150 (0.210)
	BMI	−0.13 (0.276)	0.218 (0.068)	0.138 (0.251)	0.025 (0.838)	−0.007 (0.956)	0.090 (0.458)
FGA+SGA poly	Age	−0.69 (0.055)	0.267 (0.523)	0.598 (0.118)	0.114 (0.789)	0.130 (0.758)	−0.169 (0.689)
	BMI	0.488 (0.219)	−0.159 (0.706)	−0.403 (0.323)	−0.398 (0.329)	−0.285 (0.493)	−0.287 (0.491)
SGA poly	Age	−0.25 (0.369)	0.509 (0.043)	0.004 (0.988)	−0.240 (0.389)	−0.257 (0.355)	0.470 (0.077)
	BMI	−0.05 (0.845)	−0.128 (0.649)	−0.082 (0.771)	−0.231 (0.407)	−0.230 (0.409)	0.155 (0.581)

BMI: Body mass index, FGA: First-generation antipsychotic, SGA: Second-generation antipsychotic

Table 7: Association between clinical correlates and electrocardiographic changes (*P*-values)

Medication class	ECG parameter	Patient status	Symptom frequency	Number of episodes	Treatment duration	Concomitant meds	QT-prolonging drugs	Hospitalizations
FGA	Rate	0.35	0.81	0.21	0.46	0.35	0.35	0.14
	RR interval	0.66	0.49	0.66	0.46	0.66	0.66	0.65
	T-wave	0.01	0.49	0.66	0.46	0.01	0.66	0.03
	QRS complex	0.21	0.81	0.35	0.46	0.21	0.35	0.23
	QTc interval	0.09	0.43	0.04	0.15	0.09	0.49	0.10
SGA	Rate	0.34	0.43	0.21	0.53	0.10	0.36	0.70
	PR interval	0.84	0.43	0.65	0.15	0.19	0.98	0.87
	RR interval	0.04	0.27	0.50	0.30	0.04	0.06	0.55
	TpTe interval	0.17	0.15	0.02	0.86	0.28	0.54	0.02
	TpTe/QTc	0.75	0.40	0.24	0.61	0.06	0.80	0.04
	QRS complex	0.04	0.19	0.35	0.27	0.02	0.24	0.45
FGA+SGA poly	Rate	0.17	0.06	0.17	0.77	0.69	0.41	0.59
	TpTe interval	0.47	1.00	0.47	0.26	0.29	0.47	0.45
	TpTe/QTc	0.47	1.00	0.47	0.57	0.29	0.03	0.45
SGA poly	Rate	0.44	1.00	0.68	0.63	1.00	0.26	0.59
	QRS complex	0.68	0.04	0.16	0.04	0.77	0.63	0.35
	QTc interval	0.41	0.63	0.93	0.03	0.77	0.04	0.74

FGA: First-generation antipsychotic, SGA: Second-generation antipsychotic, ECG: Electrocardiographic

Table 8: Association between lifestyle factors and electrocardiographic changes (first-generation antipsychotic and second-generation antipsychotics) (*P*-values)

Medication class	ECG parameter	Diet	Fast food	Fruit/vegetables	Exercise	Caffeine	Alcohol	Smoking
FGA	Rate	0.21	0.52	0.65	0.21	0.35	0.15	0.15
	RR Interval	0.66	0.67	0.65	0.66	0.66	0.49	0.49
	T-Wave	0.66	0.40	0.65	0.66	0.01	0.09	0.09
	QRS Complex	0.35	0.52	0.65	0.35	0.21	0.04	0.03
	QTc Interval	0.49	0.73	0.35	0.49	0.09	0.43	0.43
SGA	Rate	0.71	0.59	0.11	0.11	0.26	0.49	0.99
	PR Interval	0.04	0.26	0.93	0.17	0.76	0.44	0.42
	TpTe Interval	0.72	0.93	0.82	0.48	0.65	0.53	0.04
	QRS Complex	0.77	0.53	0.55	0.29	0.51	0.12	0.04
FGA + SGA poly	Rate	-	0.56	0.57	0.55	0.29	-	-
	TpTe/QTc	-	1.00	1.00	0.51	1.00	-	-
SGA poly	PR Interval	0.60	0.04	0.12	0.40	0.27	0.53	0.53
	QTc Interval	0.24	0.53	0.16	0.38	0.18	0.22	0.22

Empty cells (-) indicate categories where statistical analysis was not performed due to insufficient sample size for meaningful evaluation.
FGA: First-generation antipsychotic, SGA: Second-generation antipsychotic, ECG: Electrocardiographic, TpTe: T-peak to T-end, QTc: Corrected QT

include evaluation of TpTe intervals and TpTe/QT ratios.[22] This multi-parameter approach offers a more nuanced understanding of cardiac risk profiles associated with various antipsychotic medications, potentially improving clinical risk stratification.

The study's most significant contribution may be its challenge to existing classifications of antipsychotic cardiac risk. Amisulpride, typically classified as having intermediate risk for QT prolongation in Western studies, demonstrated a concerning 75% rate of both QTc and TpTe abnormalities in our sample.[23] This discrepancy could reflect several factors, including potential regional differences in prescribing patterns, genetic variations in drug metabolism among South Indian populations, or differences in concomitant medications and lifestyle factors. The high prevalence of electrolyte imbalances (50%) among amisulpride-treated patients suggests that metabolic monitoring may be particularly important for individuals

receiving this medication, as electrolyte disturbances could potentiate its cardiac effects.

Aripiprazole findings presented a particularly interesting paradox. Despite its well-established reputation as one of the most cardiac-safe antipsychotics,[20] our data revealed significant age-dependent effects on cardiac conduction and repolarization. Older patients showed marked prolongation of both RR and TpTe intervals, with correlation coefficients suggesting strong associations. These findings may reflect age-related changes in drug metabolism or the cumulative effects of prolonged antipsychotic exposure. The identification of lifestyle factors (particularly smoking and alcohol consumption) as significant modifiers of aripiprazole's cardiac effects provides clinicians with concrete targets for risk reduction strategies in patients requiring this medication.

Clozapine's well-documented cardiovascular risks were further elaborated in our study through detailed ECG parameter analysis.[19] The strong correlations between BMI and PR interval prolongation, as well as between age and TpTe/QTc ratio, provide quantifiable measures of clozapine's cardiac effects that could be useful in clinical monitoring. The novel associations we identified between clozapine use and both diabetes mellitus and episode frequency suggest that patients with these characteristics may represent particularly high-risk subgroups requiring enhanced cardiac surveillance. These findings could help refine current monitoring protocols for clozapine-treated patients.`

Haloperidol results were particularly striking, with all users showing TpTe abnormalities and three-quarters exhibiting QTc prolongation. These findings reinforce existing warnings about haloperidol's cardiac risks while providing new evidence about its effects on ventricular repolarization heterogeneity.[13,14] The universal TpTe abnormalities observed suggest that haloperidol may pose greater arrhythmogenic risk than indicated by QTc prolongation alone, potentially explaining its association with sudden cardiac death in some case reports.[15] These findings strongly support calls for enhanced cardiac monitoring with this agent, particularly in vulnerable populations.

While data on lurasidone were limited to a single case, the observed marked QTc prolongation (472 ms) suggests the need for larger-scale investigation of this relatively new antipsychotic's cardiac effects. This finding is particularly noteworthy given lurasidone's generally favorable metabolic profile and highlights the importance of comprehensive cardiac monitoring even for medications considered low-risk.[17]

Olanzapine findings revealed clinically relevant patterns that could inform monitoring strategies. The link between heart rate variability and remission status suggests that cardiac autonomic function may reflect clinical state in olanzapine-treated patients.[11] The association between aggressive behavior and specific ECG changes raises intriguing questions about potential shared neurobiological pathways mediating both behavioral and cardiac effects. The dietary correlations identified suggest that nutritional interventions might help mitigate some of olanzapine's cardiac effects, though this requires prospective validation.

Quetiapine and risperidone results highlighted important age-dependent effects that could influence clinical decision-making. The clear progression of conduction abnormalities with age in quetiapine-treated patients suggests that older individuals may require more frequent cardiac monitoring. Risperidone's duration-dependent effects on QTc prolongation emphasize the importance of ongoing surveillance even in long-term stable patients, challenging the common practice of reducing monitoring frequency after initial stabilization.[24]

The polypharmacy findings have particularly important clinical implications. The nearly 23% polypharmacy rate in our sample reflects real-world prescribing patterns, and the amplified cardiac risks we observed with antipsychotic combinations support current guidelines recommending caution with such regimens.[9] The particularly strong associations seen with SGA combinations suggest that the cardiac risks of polypharmacy may extend beyond simple additive effects, possibly involving pharmacodynamic interactions.

Several clinical implications emerge from these findings. First, they support the need for medication-specific monitoring protocols that go beyond current one-size-fits-all approaches.[18] High-risk medications like haloperidol, clozapine, and amisulpride may warrant more frequent ECG monitoring, particularly in vulnerable subgroups identified by our study (older patients, those with metabolic disorders). Second, the identification of potentially modifiable risk factors (smoking, alcohol use, diet) provides concrete targets for adjunctive interventions that could reduce cardiovascular morbidity without compromising psychiatric treatment. Third, the age-dependent effects we observed suggest that monitoring protocols should be adjusted based on patient age, particularly for medications such as aripiprazole and quetiapine.

The study's limitations must be acknowledged when interpreting these results. The cross-sectional design prevents the establishment of causal relationships, and the regional focus may limit generalizability. The absence of a control group makes it difficult to definitively attribute ECG changes to medications rather than underlying illness. Sample heterogeneity in medication regimens and the small numbers for some antipsychotics limit conclusions about those specific agents.

Future research directions suggested by these findings include (1) prospective longitudinal studies to establish temporal relationships between antipsychotic exposure and ECG changes; (2) investigation of genetic factors that might explain individual variability in cardiac susceptibility; (3) controlled trials of risk-reduction strategies targeting identified modifiable factors; and (4) development of predictive models incorporating clinical, pharmacological, and lifestyle variables to guide individualized monitoring protocols.[25]

CONCLUSION

This study significantly advances our understanding of antipsychotic-associated cardiac risks through comprehensive ECG assessment. The findings emphasize the importance of moving beyond blanket monitoring approaches to implement medication-specific, patient-tailored surveillance strategies. By identifying both high-risk medications and vulnerable patient subgroups, these results can help clinicians optimize the cardiac safety of antipsychotic therapy. The demonstration of potentially modifiable risk factors opens new

avenues for reducing cardiovascular morbidity in psychiatric patients without compromising mental health treatment. Future research should focus on validating these findings in diverse populations and translating them into clinically actionable monitoring protocols.

Authors Contribution

Dr.Elham, Dr.Lakshmi, Dr.Subhash and Dr.Bindu were involved in literature search, design of the study, statistical analysis and manuscript writing. Protocol presentation was done by Dr.Elham and supervised by other authors. Data collection was done by Dr.Elham, Dr.Lakshmi and Dr.Subhash, the same was supervised by Dr.Bindu. Data analysis, statistical analysis and manuscript writing was done by Dr.Elham, Dr.Lakshmi, Dr.Subhash. Manuscript editing and review was done by Dr.Bindu. All authors contributed to and have approved the final manuscript.

Ethical considerations

The study was approved by the Scientific Research and Ethics Committee of the Institute. Informed consent was taken from all participants.

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Conflicts of interest

There are no conflicts of interest.

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Original Article

Association between adverse childhood events with depression and resilience among late adolescents and young adults

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Abstract

Background: While depression in children and adolescents can stem from several reasons, such as biological predispositions and environmental stressors, one of the significant and predominant contributors is adverse childhood events (ACE). Therefore, the present study tries to understand the association of adverse childhood events with depression and resilience among adolescents and young adults.

Materials and Methods: This community-based cross-sectional study included 300 participants aged 14–24 years residing in urban, rural, and tribal areas. Data on ACEs, depression, and resilience were collected through the house-to-house interview using a standardized, predesigned, and validated questionnaire employing a simple random sampling method.

Results: Our study found that 45.4% experienced depression at various levels. Resilience levels varied, with 40% of participants having low resilience, 59% normal resilience, and only 1% exhibited high resilience. Among ACEs, emotional abuse (44.7%) and neglect (71.7%) were most prevalent, while physical abuse (24%) and neglect (62.3%) were also reported. Statistical analysis showed significant associations between emotional abuse ($P < 0.001$) and physical abuse ($P < 0.001$) with depression. In urban and rural areas, physical abuse ($P = 0.001$) was associated with depression, while in urban areas, physical neglect ($P = 0.001$) also showed significant associations with depression. However, there was no significant association between emotional or physical neglect and resilience.

Conclusion: The study revealed that there is an association between ACE with depression and resilience. Furthermore, there was a negative correlation between resilience and depression.

Keywords: Adolescents, adverse childhood events, depression, resilience, socio demographic variables

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INTRODUCTION

Mental health issues have been a serious and surging problem for the past few decades globally and almost 1 billion people are suffering from mental disorders, pointing to the fact that anyone, anywhere around the world, may be affected by it. Children are affected by mental health disorders as early as 14 years, and one in every seven 10–19 year-old experience mental health problems and suicide is the 4th leading cause of death (one in every 100 deaths) in young people aged 15–29 years.[1] It is also noted that most unidentified mental health problems develop during the adolescence period, of which many become life-long disorders.[2,3]

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The most common mental health issues among adolescents and young adults include depression, anxiety disorder followed by panic disorder, hyperactivity, substance use disorders, and suicide, of which depression exhibits a higher prevalence compared to other disorders.[4]

Depression is an emotional state marked by sadness; feelings of helplessness, worthlessness, and guilt; a withdrawal from others, and disturbances in appetite, sexual desire, and sleep.[5] Although there are multiple interrelated causes for depression in children and adolescents, one of the most prevalent causes is trauma and adverse childhood events (ACEs). Childhood adverse experiences

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or childhood trauma can be staunchly linked with chronic depression in adulthood.[6]

ACEs usually involve any of these or in a combination of emotional, physical, sexual abuse, physical and emotional negligence, violent treatment of the mother, household substance abuse and mental illness, parental separation or divorce, incarcerated household member, and household dysfunction. Various studies emphasize that this, in turn, leads to harmful and long-lasting health effects on adulthood.[7] Research studies among adults have revealed that adults who were exposed to ACEs during their childhood were substantially more likely to develop poor physical, mental, and behavioral health outcomes than those who were not exposed.[8] Although mental illnesses can be treated with cognitive behavioral therapies, medications, and, in some rare cases, with surgery, adolescents with mental disorders remain undetected and untreated due to various factors, especially social stigma.[1] To comprehensively explore the interplay between ACEs and depression, it is essential to understand some of the protective factors that may mitigate the risk of depression in the presence of ACEs. One such factor is resilience, characterized by one's ability to adapt effectively in the face of trauma, tragedy, or other significant stressors.[9]

Given the fact that there is no agreed on definition of resilience, all definitions of resilience are fundamentally considered as positive outcomes. Psychological resilience is one's ability to bounce back or overcome adverse situations despite depressive emotion.[10] Children exposed to ACE with stronger resilience have been shown to associate with desirable positive outcomes such as lower, rates of maladaptive behaviors, and stress symptomatology. As a result, child resilience demonstrates the mediation of ACE effects on few mental health outcomes among children and adolescents.[11] Several factors are associated with high resilience in children. Positive family support, good parenting, quality time spent with parents, and engaging in various physical activities are all positive factors that are associated with high resilience in children.[12] Many studies on building resilience in children have found that schools have an important role when the family economy is a risk factor, but in India, majority of the schools lack the necessary psychological support for children. Resilience can be built academically by training the children to deal with stress and by cultivating physical activity in any form, such as sports, drawing, yoga, etc., A good and positive family environment and parents devoting quality time to their children can help foster resilience at home.[13]

Hence, this study aims to understand the prevalence of depression among adolescents and young adults in urban, rural, and tribal areas who have experienced ACEs. In addition, it aims to determine the association between ACEs with depression and resilience among them and the correlation between depression and resilience.

MATERIALS AND METHODS

Study design and setting

A community-based cross-sectional study was carried out for 6 months from December 2022 to June 2023. The study sample included late adolescents aged between 14 and 19 years and early adults aged between 20 and 24 years residing in urban, rural, and tribal areas. The eligibility criteria included adolescents aged between 14 and 19 years and early adults between 20 and 24 years who were willing to participate in the study. Participants whose parents did not give written consent, adolescents who did not assent to participate in the study and those who were unable to comprehend the questionnaire were excluded. With a 56% prevalence of depression among children who had experienced ACEs,[14] the initial estimated sample size was 95, calculated using the formula $n = z^2pq/d^2$, where z represents the 95% confidence interval (1.96), p denotes the depression prevalence (56%), q is the complementary value to 100 (44%), and d signifies a permissible error of 10%. However we conducted interviews among 100 late adolescents and young adults in each urban (n=100), rural a total sample size of 300 (N). Accredited Social Health Activist's provided a list of households in the rural, urban, and tribal field practice areas. From each of the field practice area, households were selected for the study using simple random sampling through lottery method. Based on the inclusion criteria, the study participants in their late adolescents and early adulthood were recruited purposefully from the selected households. If the selected household did not have members that met the inclusion criteria, the next consecutive household was selected. In case the house selected was closed on the three consecutive visits, the next household was chosen to avoid selection bias.

Data collection

The data were collected through the house-to-house interview using a standardized, predesigned, and validated questionnaire by trained personnel. This comprehensive survey covered a spectrum of important details, encompassing sociodemographic characteristics such as age, gender, parental education and occupation, socioeconomic status, and more. It also explored adverse childhood experiences through the childhood trauma questionnaire (CTQ), measured resilience using the Brief Resilience Scale (BRS), and evaluated depression utilizing the Physical Health Questionnaire-9, which ensured reliable assessment.

Before the interviews, thorough explanations regarding the study's purpose and significance were provided to both the parents and the participants. Their voluntary participation was confirmed through written informed consent and assent, with an assurance of safeguarding their data privacy and ensuring confidentiality throughout the research process helping to minimize response bias.

Study measures

Childhood Trauma Questionnaire[15,16]

The CTQ is a self-administered, retrospective measure of childhood trauma. It contains 28 items, of which 25 items are split into five subscales: emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect. The three remaining questions make up the minimization/Denial scale, which is used to help determine if respondents are underreporting their childhood trauma. The responses range from Never true to very often true. The five subscale item scores are summed to produce the scale total score. The higher the score is, the greater the severity of maltreatment. The Cronbach's alpha for the four subscales is 0.824.[17] In this current study, subscale related to sexual abuse was not included.

Brief Resilience Scale[18]

The BRS questionnaire is used to assess the ability to bounce back or recover from stress. It comprises 6 items, which are both positively

and negatively worded. The responses range from strongly disagree to strongly agree. The responses are added range from 6 to 30, then this sum is divided by the total number of questions answered, which is then interpreted as low resilience, normal resilience, or high resilience. BRS is found to have Cronbach's alpha value of 0.71.[19]

Patient Health Questionnaire 9

The Patient Health Questionnaire (PHQ) scale is used to assess depression among study participants. It consists of 9 items with responses not at all to nearly every day, the values range from 0 to 3. The total sum of responses lies between 1 and 27. The interpretation is as follows: 1–4 = Minimal depression, 5–9 = Mild depression, 10–14 = Moderate depression, 15–19 = moderately severe depression, 20–27 = Severe depression. The Cronbach's alpha value ranged from 0.717 to 0.890.[20,21] For the purpose of the study, those participants who had minimal and no depression were considered as having no depression, and those who's scores suggested mild depression, moderate depression, moderately severe depression, and severe depression were considered as depressed.

Statistical analysis

The data were entered and cleaned into MS Excel and analyzed using SPSS Statistics for Windows, Version 22.0. IBM Corp., Armonk, NY (Licensed to the institution). Data were checked for missing values, and descriptive statistical measures such as percentage, mean, and standard deviation were used to summarize the data as appropriate. Inferential statistical tests such as the Chi-square test/Fischer's exact test were used to find the association between sociodemographic variables and ACEs with resilience and depression. Spearman's correlation test was used to correlate resilience and depression scores. Graphs and tables were used as appropriate, and the statistical test results were interpreted as statistically significant at $P < 0.05$.

Ethical approval

The study was approved by the Institutional Ethics committee (JSS/MC/PG/113/2022–23) dated April 20, 2022, JSS Medical College, Mysuru.

RESULTS

Sociodemographic characteristics

Among the 300 study participants, significant proportion was female (58%). The predominant age group was 20–24 years, accounting for 60.3% of the participants, and notably 28.7% completed high school education. Most of the participant's parents were illiterates and belonged to unskilled labor by profession. More than half of the participants belonged to nuclear family (57%) and upper socioeconomic status (42.3%) [Table 1].

Table 1: Sociodemographic characteristics of the study participants (*n*=300)

Sociodemographic characteristics	Category	Frequency, *n* (%)
Age (years)	14–19	119 (39.7)
	20–24	181 (60.3)
Gender	Male	126 (42)
	Female	174 (58)
Education	Illiterate	8 (2.7)
	Primary school	11 (3.7)
	Middle school	27 (9)
	High school	86 (28.7)
	Intermediate/diploma	79 (26.3)
	Graduate	49 (16.3)
	Professional degree	40 (13.3)
Education status of father	Illiterate	96 (32)
	Primary school	51 (17)
	Middle school	26 (8.7)
	High school	35 (11.7)
	Intermediate/diploma	33 (11)
	Graduate	35 (11.7)
	Professional degree	24 (8)
Father's occupation	Unemployed	15 (5)
	Unskilled worker	99 (33)
	Semi-skilled worker	37 (12.3)
	Skilled worker	27 (9)
	Clerical/shop/farm	60 (20)
	Semi professional	18 (6)
	Professional	44 (14.7)
Education status of mother	Illiterate	81 (27)
	Primary school	37 (12.3)
	Middle school	44 (14.7)
	High school	61 (20.3)
	Intermediate/diploma	37 (12.3)
	Graduate	27 (9)
	Professional degree	13 (4.3)
Mother's occupation	Unemployed	131 (43.7)
	Unskilled worker	83 (27.7)
	Semi-skilled worker	22 (7.3)
	Skilled worker	11 (3.7)
	Clerical/shop/ farm	23 (7.7)
	Semi professional	13 (4.3)
	Professional	17 (5.7)
Place of residence	Urban	100 (33.3)
	Rural	100 (33.3)
	Tribal	100 (33.3)
Type of family	Nuclear family	171 (57)
	Single parent family	49 (16.3)
	Joint family	63 (21)
	Blended family	10 (3.3)
	Extended family	7 (2.3)
Socioeconomic status	I - Upper class	127 (42.3)
	II - Upper middle class	53 (17.7)
	III - Middle class	56 (18.7)
	IV- Lower middle class	42 (14)
	V - Lower class	22 (7.3)

Prevalence of depression and resilience

Of the 300 participants, 28.7% had minimal depression, 30.7% had mild, and 14.7% moderate, with no cases of severe depression [Figure 1]. Notably, the highest proportion of participants with no depression was found among tribal participants (49%), while minimal (43%) and mild (36%) are more prevalent among rural and urban participants. Resilience levels varied, with 1% of the participants exhibiting very high resilience, 59% normal resilience, and 40% low resilience, despite majority of them experiencing mild to moderate depression [Figure 2]. Normal resilience is most prevalent in all groups (urban – 57%, rural – 62%, and tribal – 58%), while high resilience is minimal, especially absent in rural participants.

Prevalence of adverse childhood events

The key ACEs studied were emotional abuse, physical abuse, emotional neglect, and physical neglect. Emotional abuse was less common in rural and tribal areas, while 13% of the study participants from urban areas expressed that they were

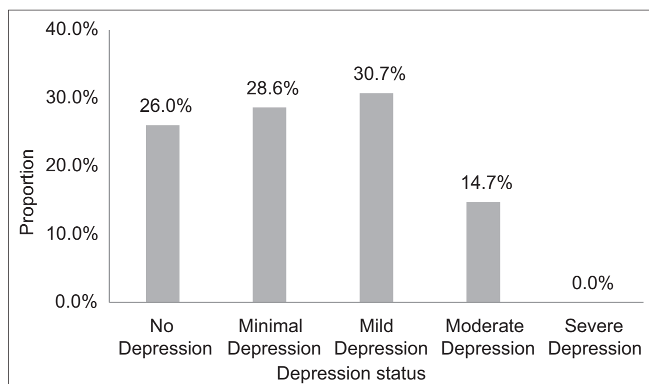

Figure 1: Prevalence of depression among study participants ($n = 300$)

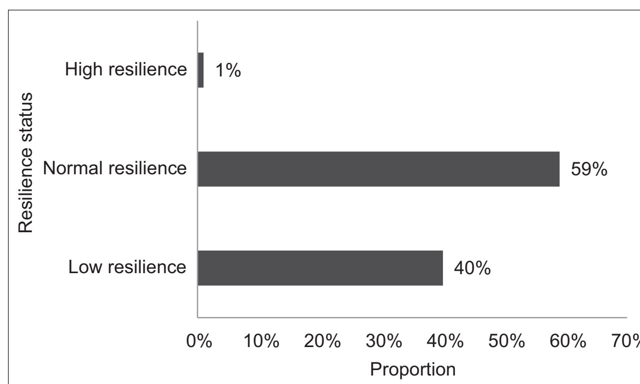

Figure 2: Distribution of study participants based on resilience scores ($n = 300$)

physically abused. Regardless of the residence, majority (47%) of the participants expressed that they faced low emotional neglect. A greater number of the study participants from the tribal community reported that they were physically neglected by their family members [Table 2].

Table 2: Adverse childhood events based on residence of the study participants

Variables	Category	Urban (n=100), n (%)	Rural (n=100), n (%)	Tribal (n=100), n (%)
Emotional abuse	None	58 (58)	45 (45)	63 (63)
	Low	19 (19)	35 (35)	28 (28)
	Moderate	6 (6)	11 (11)	5 (5)
	Severe	17 (17)	9 (9)	4 (4)
Physical abuse	None	76 (76)	80 (80)	86 (86)
	Low	9 (9)	8 (8)	9 (9)
	Moderate	2 (2)	7 (7)	4 (4)
	Severe	13 (13)	5 (5)	1 (1)
Emotional neglect	None	46 (46)	34 (34)	5 (5)
	Low	38 (38)	59 (59)	43 (43)
	Moderate	8 (8)	5 (5)	50 (50)
	Severe	8 (8)	2 (2)	2 (2)
Physical neglect	None	62 (62)	49 (49)	3 (3)
	Low	13 (13)	15 (15)	8 (8)
	Moderate	1 (1)	23 (23)	27 (27)
	Severe	13 (13)	13 (13)	62 (62)

n: Frequency

Association of adverse childhood events with depression and resilience

Overall, there was a significant association between emotional ($P < 0.001$) and physical abuse ($P < 0.001$) with depression. Across residences, emotional abuse was statistically significant in urban ($P = 0.005$), rural ($P = 0.001$), and tribal ($P = 0.005$) areas, while physical abuse showed significance in urban ($P = 0.001$) and rural ($P = 0.004$) areas. In addition, emotional neglect ($P = 0.001$) and physical neglect ($P = 0.001$) in urban areas were significantly linked to depression. Emotional abuse ($P < 0.001$) was significantly associated with resilience across the study population, with notable significance in urban ($P = 0.005$) and rural ($P < 0.001$) areas, while physical abuse showed a significant association with resilience in urban areas ($P = 0.003$) [Tables 3 and 4].

Correlation between depression and resilience scores

The scatter plot [Figure 3] shows the negative correlation between depression scores (X-axis) and resilience scores (Y-axis), indicating that higher depression scores correspond to lower resilience scores and vice versa. The Spearman's correlation coefficient, $r = -0.253$, is statistically significant ($P = 0.000$), confirming this inverse relationship.

DISCUSSION

The current study aimed to understand the relationship between ACEs with depression and resilience among adolescents and young adults residing in rural, urban, and tribal settings. Several research studies have established an association between adverse events or maltreatment in childhood with poor mental and behavioral health outcomes in adult life, suggesting the need for prevention strategies. Desch *et al*. in their study, revealed that children who have experienced more than 4 ACEs in their childhood are 4.6 times more prone to be depressed in their adulthood, compared to children without a history of ACEs.[22] In mitigation of these mental disorders, resilience acts as a protective factor.[23]

Prevalence of depression and resilience among adolescents and young adults

The current study found a high prevalence of depressive symptoms, with mild and moderate depression being the most common. This prevalence was notably higher than the study conducted by Chu *et al*., wherein they reported that 12.33% of their study participants had depressive symptoms, with 7.11%, 4.02%, and 1.20% participants having mild, moderate, and severe depressive symptoms, respectively.[24] Another comparative study of rural, urban, and tribal communities in Nigeria, revealed that the prevalence of depression was as low as 5.2% among adults, and among adolescents, it was 9.6%.[25] These differences in the prevalence can be attributed to the geographical variations in urban, rural, and tribal regions across and within countries, and different questionnaire used to screen depression.

Mild depression was found to be the most common, which was similar to the findings of Mohta *et al*. who found that the prevalence of depression among adolescents was almost 30%, with mild depression being more common than the other types.[26] Bharati *et al*., similarly revealed that among adolescents aged 11–19 years residing in urban settings of Patna, 51.2% were depressed, with mild

Table 3: Association of adverse childhood events with depression (*n*=300)

Depression	Adverse childhood events				Total	Chi-Square value	*P*
	None	Low	Moderate	Severe			
Emotional Abuse							
No	109 (66.5%)	47 (28.7%)	5 (3%)	3 (1.8%)	164 (100%)	41.539	0.000*
Yes	57 (41.9%)	35 (25.7%)	17 (12.5%)	27 (19.9%)	136 (100%)		
Physical Abuse							
No	149 (90.9%)	10 (6.1%)	3 (1.8%)	2 (1.2%)	164 (100%)	27.582	0.000*
Yes	93 (68.4%)	16 (11.8%)	10 (7.4%)	17 (12.5%)	136 (100%)		
Emotional Neglect							
No	52 (31.7%)	72 (43.9%)	36 (22%)	4 (2.4%)	164 (100%)	4.405	0.221
Yes	33 (24.3%)	68 (50%)	27 (19.9%)	8 (5.9%)	136 (100%)		
Physical Neglect							
No	66 (40.2%)	19 (11.6%)	33 (20.1%)	46 (28%)	164 (100%)	0.787	0.853
Yes	48 (35.3%)	17 (12.5%)	29 (21.3%)	42 (30.9%)	136 (100%)		

Note: Numbers in the parenthesis indicate percentage row-wise. *Chi-square test at $P<0.05$ statistically significant

Table 4: Association of adverse childhood events with resilience (*n*=300)

Resilience	Adverse Childhood Events				Total	Chi-Square value	*P*
	None	Low	Moderate	Severe			
Emotional Abuse							
Low	46 (38.3%)	39 (32.5%)	13 (10.8%)	22 (18.3%)	120 (100%)	30.027	0.000¥
Normal	117 (66.1%)	43 (24.3%)	9 (5.1%)	8 (4.5%)	177 (100%)		
High	3 (100%)	0	0	0	3 (100%)		
Physical Abuse							
Low	87 (72.5%)	17 (14.2%)	5 (4.2%)	11 (9.2%)	120 (100%)	11.657	0.059¥
Normal	152 (85.9%)	9 (5.1%)	8 (4.5%)	8 (4.5%)	177 (100%)		
High	3 (100%)	0	0	0	3 (100%)		
Emotional Neglect							
Low	24 (20%)	60 (50%)	31 (25.8%)	5 (4.2%)	120 (100%)	9.555	0.105¥
Normal	59 (33.3%)	79 (44.6%)	32 (18.1%)	7 (4%)	177 (100%)		
High	2 (66.7%)	1 (33.3%)	0	0	3 (100%)		
Physical Neglect							
Low	36 (30%)	15 (12.5%)	24 (20%)	45 (37.5%)	120 (100%)	9.353	0.092¥
Normal	76 (42.9)	21 (11.9%)	37 (20.9%)	43 (24.3%)	177 (100%)		
High	2 (66.7%)	0	1 (33.3%)	0	3 (100%)		

Note: Numbers in parenthesis indicate percentage row-wise ¥Fischer's exact test with Yates continuity correction, *Chi-square test at $P<0.05$ statistically significant

Figure 3: Correlation between depression and resilience scores of study participants

depression being most common among other types.[27] However, evidence from a school-based cross-sectional comparative study in Mysuru, which was carried out to assess the prevalence of mental abnormalities among the age group of 14–16 years residing in urban, rural, and tribal areas, found that urban residents exhibited a higher prevalence of major depressive disorders, accounting for 4.1% of the total depressive study participants.[28] Mishra *et al.*,[29] further compared the prevalence of depression and anxiety among 11–18 years residing in the rural and suburban areas of eastern Uttar Pradesh and found the overall prevalence of depression to be 14.5%.

Association of adverse childhood events with depression

Physical neglect emerged as the predominant and most severe form of ACE among participants belonging to the tribal region, while emotional abuse, physical abuse, and emotional neglect were found to be more prevalent among urban participants in our study. These findings align with Yen *et al.*'s study on the effects of childhood physical abuse in adolescents living in rural Taiwan, which reported that those who had experienced childhood physical abuse were said more likely to get depression, especially among females, those from poor family function and whose parents are habitual drinkers.[30] In addition, it was also found that as ACE scores increased, the chance of experiencing and developing suicidal thoughts and attempts, alcohol and drug abuse, and depression during adulthood.[31]

Association of adverse childhood events with resilience

Folayan *et al.*'s study[32] in their cross-sectional study to evaluate internal consistency and correlation of ACE, resilience, and self-esteem among Nigerian children aged 11–16 years old, evidenced that higher resilience is associated with low ACE (r = −0.07). This was supported by Lackova Rebicova *et al.*'s study, that ACE and

resilience are associated with emotional and behavioral problems which were significantly associated, meaning that more ACE causes more emotional and behavioral problem (0.78), and in contrast, if resilience increases, then emotional and behavioral problems decrease (−0.73).[33,34] These studies were consistent with our study findings.

Our study also showed results consistent with other studies, that depression is inversely related to resilience.[5,35]

Strengths and limitations

The study explores depression and resilience across different geographical regions, including rural, urban, and tribal areas, providing insights into diverse populations in the background of ACEs.

Limitations would be that the PHQ-9 and BRS questionnaires serve as valuable screening tools; they also possess inherent limitations that may impact the accuracy of their assessments. Second, not including the section on sexual abuse in the CTQ questionnaire represents a notable limitation, potentially leading to gaps in understanding and addressing this critical aspect of trauma exposure. Also, the study relies on self-reported data on ACEs and resilience, where participants may have overestimated or underestimated their answers, leading to social desirability bias, and the cross-sectional nature of the study does not allow for causal relationships, highlighting the need for future longitudinal studies.

Recommendations

Future research should explore the long-term effects of ACEs on mental health outcomes and resilience, considering factors such as family dynamics, social support systems, and access to mental health services.

Furthermore, efforts should be made to integrate mental health education and support services into schools by training teachers, ensuring early detection and intervention for at-risk adolescents. By prioritizing mental health and resilience-building initiatives, we can work towards creating a more supportive and resilient environment for young people facing adversity.

Author contributions

RM was primarily responsible for the data acquisition, statistical analysis, and manuscript preparation. SMC contributed to the development of concepts, study design, definition of intellectual content, manuscript preparation, editing, review. SB participated in statistical analysis, manuscript preparation, editing, and review.

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Conflicts of interest

There are no conflicts of interest.

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Original Article

Prevalence of poor mental health and its socioeconomic correlates in Kurdish population

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Abstract

Context: Poor mental health (PMH) is an important public health issue and affects various aspects of individuals' lives.

Aims: In this study, we examine the prevalence of PMH and its socioeconomic correlates in the Kurdish population.

Settings and Design: This cross-sectional study investigated 2010 individuals aged 35–70 years of recruitment phase of Dehgolan prospective cohort study.

Materials and Methods: We employed systematic random cluster sampling to select participants. Mental health across four domains, including psychosomatic, anxiety, depression, and social function, was assessed using the General Health Questionnaire-28. Demographic and socioeconomic information were also collected.

Statistical Analysis Used: Logistic regression was used to examine associations between variables and PMH.

Results: The study findings revealed a PMH prevalence of 29% among the participants. Social dysfunction exhibited the highest prevalence (65.92%), followed by anxiety (29.60%), psychosomatic disorders (24.43%), and depression (11.84%). Odds ratios for females (3.12), 46–60 years' age group (1.31), singles (1.67), and those with lower education (1.82) and lower economic status (1.37) were significantly associated with PMH. Current smoking and alcohol consumption were associated with increased risk of PMH.

Conclusion: This study highlights the significant prevalence of PMH in the population and its association with socioeconomic factors. Low education, low socioeconomic status, smoking, and alcohol consumption were correlated with PMH. Efforts should focus on improving socioeconomic conditions, health promotion, and ensuring access to mental healthcare services, especially for vulnerable groups.

Keywords: General Health Questionnaire-28, poor mental health, prevalence

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INTRODUCTION

Poor mental health (PMH) is a critical public health concern, impacting social, occupational, and educational functioning. The implementation of mental health programs in communities aims to provide necessary support for maintaining mental well-being.[1] PMH encompasses various manifestations, including depression, anxiety, somatization, and social dysfunction, which can significantly impact individuals, leading to disability and reduced efficiency.[2] In Iran, a National Health and Risk Factors Surveillance Survey conducted in 2011 reported a prevalence of PMH at 23.6% among individuals aged 15 years and above.[3] Specifically, social dysfunction and somatization, which are important factors in PMH within the Iranian population, have been estimated at 79.5% and 34.5%, respectively.[4] Depression and anxiety, representing other significant factors in PMH, exhibit a range of symptoms from mild to severe, with reported prevalence rates of 29% and 32.2%, respectively, in a study conducted in Yazd city.[5,6] Given the substantial prevalence of mental health disorders, the importance of employing valid questionnaires and standardized clinical

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interviews for mental health screening has become crucial.[7] Various factors influence individuals' mental health, with socioeconomic status (SES) standing as one of the most significant determinants. According to the World Health Organization, SES refers to the conditions in which individuals are born and grow, which can have a profound impact on mental health.[8] SES can be classified into three main groups: classical factors (such as education and income/wealth), population factors (including age, gender, and marital status), and jurisdictional factors (encompassing cultural and lifestyle factors).[9] Individuals with low SES face various challenges and are more susceptible to factors that negatively affect mental health, such as financial difficulties, strained social relationships, job-related stress, and health complaints, when compared to those with higher SES.[10] Unhealthy lifestyles, including engaging in risky behaviors, coupled with low SES, further exacerbate mental health issues among individuals as compared to those maintaining a healthy lifestyle.[11] While similar studies have been conducted in the country, the results cannot be generalized due to cultural, geographical, and social differences, as well as the specific ethnic composition of the population under investigation, which consists of individuals of Kurdish ethnicity.[7] Therefore, this study aims to investigate the prevalence of PMH and its four dimensions, namely somatization, anxiety, depression, and social dysfunction, while exploring their correlation with SES within the Kurdish population.

MATERIALS AND METHODS

Study population

This study utilized data from participants in the baseline phase of the Dehgolan prospective cohort Study (DehPCS) conducted in Dehgolan city, which is a part of the larger Persian Cohort Study. The participants met the following criteria: permanent residents of Dehgolan city, aged between 35 and 70 years, with a minimum of 1 year of residency and at least 9 months of stay per year, ability to communicate, and Iranian citizenship. The study excluded individuals who were unwilling to participate or had physical or mental incapacities that hindered communication. After inviting individuals who met the criteria and explaining the research objectives, informed consent forms were signed by the participants. Based on the prevalence of PMH at 31%,[12] an accuracy of 0.03, a design effect of 1.2, and anticipated nonresponse rate of 15%, the calculated minimum sample size required was 1750 individuals. However, in the study conducted, questionnaires were successfully completed by 2010 participants, significantly exceeding the minimum sample size requirement. A random sampling method was adopted to select participants, thereby reducing the risk of selection bias and ensuring a representative sample. Further details about the study design have been described in a previous study.[13]

Data collection

This study received approval from the Research Deputy of Kurdistan University of Medical Sciences, with the ethics code number IR. MUK. REC.1401.408. Trained individuals collected all data using specialized online software designed for this research, through interviews and physical examinations. Age was calculated based on official identification documents, and education was categorized into four groups based on the number of years of schooling. Marital status was divided into two categories: married and single (including unmarried, divorced, or widowed). The wealth index was assessed using the principal component analysis method, considering durable goods, housing characteristics, and other facilities, and was divided into three categories: poor, middle, and rich. Technicians measured weight and height using Seka scales with an accuracy of 0.1 kg and Seka stadiometer with an accuracy of 0.1 cm, respectively. Body mass index (BMI) was calculated as weight (kg) divided by height (m^2) and classified into three categories: below 25 (normal), 25–29.9 (overweight), and above 30 (obese). Individuals who had smoked fewer than 100 cigarette sticks in their lifetime were classified as "nonsmokers" and further categorized into three groups: smokers, nonsmokers, and ex-smokers. Individuals who consumed approximately 200 ml of alcohol or 45 ml of alcohol once a week for at least 6 months were classified as "alcohol consumers." Illicit/illegal drug use referred to the consumption of illicit drugs once a week for at least 6 months.

General mental health

To assess the general mental health of the participants, the General Health Questionnaire (GHQ-28) was utilized. Standardized procedures were implemented to ensure data quality, including employing trained personnel who were native Kurdish speakers to administer the questionnaire and using a 1-month recall period to enhance the accuracy of responses. This questionnaire is a standardized screening tool used to identify physical and mental health problems in various settings. It measures components such as general and physical health, anxiety, depression, and social dysfunction. The questionnaire was initially developed by Goldberg,[14] and its validity and reliability have been tested in the Iranian population.[15] It consists of questions concerning physical symptoms and general health (questions 1–7), anxiety (questions 8–14), social functioning (questions 15–21), and depression (questions 22–28), with four response options. The scoring was conducted using the Likert method, where options were scored as 0–1–2–3. The maximum score on this questionnaire is 84, and a score of 23 or higher indicates the presence of mental health problems.

Statistical analysis

Continuous quantitative variables were reported as mean and standard deviation, while qualitative variables, including nominal, dichotomous, and ordinal variables, were reported as frequency and percentage. The Chi-square test was employed to compare prevalence between groups. The prevalence of PMH and its domains, along with a 95% confidence interval (CI), were reported. In selecting variables for logistic regression models, based on previous literature, we focused on those that have a solid theoretical or empirical basis for inclusion. Statistical tests, such as the Wald test, also were employed to assess the significance of each variable in predicting the outcome. Typically, variables with $P < 0.2$ were considered significant and were included in the multivariable logistic regression model. Odds ratios (ORs) for each dependent variable were calculated, with a 95% CI and a significance level of 0.05.

Given that the proportion of missing data was relatively small, listwise deletion was deemed appropriate.

RESULTS

Demographic characteristics are presented in Table 1. Overall, out of 2010 participants, 56.56% were female. The mean age of the

Table 1: Total mental health wellbeing by demographic and socioeconomic characteristics of participants in Dehgolan prospective cohort study

	Total	Dysfunction, *n* (%)	Normal, *n* (%)	*P*
Gender				
Male	873	152 (17.41)	721 (82.59)	>0.001
Female	1137	431 (37.91)	706 (62.09)	
Age groups				
35–45	861	205 (23.81)	656 (76.19)	>0.001
46–60	894	292 (32.66)	602 (67.34)	
>60	255	86 (33.73)	169 (66.27)	
Marital status				
Married	1839	497 (27.03)	1342 (72.97)	>0.001
Single	171	86 (50.29)	85 (49.71)	
Education years				
Illiterate	600	260 (43.33)	340 (56.67)	>0.001
1–5	575	165 (28.70)	410 (71.30)	
6–12	603	127 (21.06)	476 (78.94)	
University	232	31 (13.36)	201 (86.64)	
Economic status				
Poor	777	272 (35.01)	505 (64.99)	>0.001
Moderate	598	176 (29.43)	422 (70.57)	
Rich	629	131 (20.83)	498 (79.17)	
BMI				
Normal weight	505	133 (26.34)	372 (73.66)	0.006
Over-weight	836	226 (27.03)	610 (72.97)	
Obese	660	222 (33.64)	438 (66.36)	
Cigarette smoking				
No smoker	1517	453 (29.86)	1064 (70.14)	0.357
Ex-smoker	159	43 (27.04)	116 (72.96)	
Smoker	317	83 (26.18)	234 (73.82)	
Illicit drug use				
No	1738	512 (29.46)	1226 (70.54)	0.296
Yes	255	67 (26.27)	188 (73.73)	
Alcohol use				
No	1732	514 (29.68)	1218 (70.32)	0.106
Yes	262	65 (24.81)	197 (75.19)	

BMI: Body mass index

participants was 48.52 ± 9.06 years, and only 12.69% of them were in the age group of over 60 years old. In general, 91.49% of the participants were married, and 29.85% were illiterate. 15.71% of the participants were current smokers, 12.68% had a history of illicit/illegal drug use, and 13.03% had a history of alcohol consumption.

The overall prevalence of PMH in the study population was 29.00% (95% CI: 27.06–31.03). PMH occurred 20% more frequently in women than in men. The prevalence of PMH increased with age, reaching around 10% higher prevalence in the age group of above 60 years compared to the youngest age group. Furthermore, single individuals reported approximately 23% higher prevalence of PMH compared to married individuals. Individuals with better SES were less likely to have PMH, with the prevalence being about 15% and 30% higher in the lowest economic (poor) and educational (illiterate) groups, respectively [Table 1].

The prevalence of each domain of PMH is presented in Table 2. The highest ratio was related to social dysfunction with a prevalence of 65.92% (95% CI: 63.82–67.96), followed by anxiety 29.60 (95% CI: 27.64–31.64), somatoform 24.43 (95% CI: 22.60–26.36), and the lowest ratio was depression with a prevalence of 11.84 (95% CI: 10.5–13.33). Based on age group, the highest prevalence of PMH across all four domains was observed in individuals aged >60 years, except for anxiety/insomnia, which showed the highest prevalence in the 46–60-year age group. The prevalence of mental health disorders in all four areas was significantly higher in women than in men and about 1.5 times higher in single individuals than in married individuals. The prevalence of mental health disorders in all four areas showed a significant inverse dose–response relationship with SES and education (Cochran–Armitage *P* value for trend < 0.001). The prevalence of somatoform disorders in nonsmokers, individuals with no history of substance and alcohol use, was reported to be almost 8% higher than in users of these substances [Figure 1].

Table 3 shows the independent ORs of variables related to PMH and its domains. Female gender was a strong independent predictor of PMH (OR = 3.12, CI: 2.22–4.45) and all four symptom domains. The adjusted ORs for somatoform, anxiety, depression, and social dysfunction symptoms were 2.38, 1.85, 2.5, and 4.17, respectively. Overall, the 46–60 years' age group (OR = 1.31, CI: 1.01–1.69) and singles (OR = 1.67, CI: 1.18–2.36) were independently associated with a higher chance of PMH. Regarding socioeconomic variables, individuals with higher education (OR = 0.55, CI: 0.33–0.93), and better economic status (OR = 0.73, CI: 0.55–0.97) had a lower chance of PMH. This relationship was still present for different symptom domains, with academic education being independently associated with a decrease in somatoform and anxiety symptoms by 0.4 and 0.67, respectively. Individuals with higher economic status also had a 0.36 lower chance of somatoform symptoms. Current smoking (OR = 1.68, CI: 1.17–2.41) and alcohol consumption (OR = 1.44, CI: 1.00–2.06) were associated with a significant increase in the chance of PMH. Current smoking was also associated with a significant increase in the chance of somatoform, anxiety, and depression symptoms by 53%, 92%, and 70%, respectively. Although there was no significant association between a history of illicit/illegal drug use and overall PMH symptoms, these individuals had a significantly higher chance of showing depression symptoms (OR = 1.46, CI: 1.00–2.11).

DISCUSSION

The results of the present study indicate that the prevalence of mental health disorders in western Iran was 29%. Other national studies conducted in 2015[7] and 2020[16] reported prevalence rates of 23% and 33%, respectively. In a study conducted in Fars province,[17] the prevalence of mental health disorders was reported as 22%, while in Tehran[18] and Ilam,[19] it was 37% and 43.2%, respectively. In addition, among health workers, the prevalence of mental health disorders was reported as 34%.[20] In 2020, similar international studies also documented high prevalence rates of 34% in Italy[21] and 32% in Spain.[22] Among other countries, the prevalence in[23] and America[24] was reported as 13% and 25%, respectively, which is lower than the prevalence found in the present study. In China[25] and Lebanon,[26] the prevalence was 29% and 30%, respectively, which is similar to the findings of the present study. It appears that the differences in the prevalence statistics of PMH may be due to the use of different tools for collecting information in different populations and at different times of the study, especially during the COVID-19 era, which can lead to significant variations in the statistics.

In the present study, the prevalence of social dysfunction was reported to be 66%. This result indicates that 2 out of 3 adults in this region

Table 2: Mental health wellbeing according to the four General Health Questionnaire - 28 domains by demographic and socioeconomic characteristics of participants in Dehgolan prospective cohort study

	Somatic symptom (CI)	Anxiety/insomnia (CI)	Depression symptom (CI)	Social dysfunction (CI)
Gender				
Male	12.26 (10.24–14.60)	20.50 (17.95–23.31)	8.25 (6.60–10.27)	55.10 (51.78–58.37)
Female	33.77 (31.08–36.58)	36.59 (33.83–39.43)	14.60 (12.66–16.78)	74.23 (71.61–76.69)
Age groups				
35–45	18.12 (15.68–20.84)	24.97 (22.19–27.97)	10.45 (8.58–12.68)	62.14 (58.85–65.32)
46–60	28.52 (25.66–31.57)	34.12 (31.08–37.29)	11.97 (10–14.27)	67.56 (64.42–70.55)
>60	31.37 (25.97–37.33)	29.41 (24.14–35.30)	16.08 (12.06–21.11)	72.94 (67.15–78.04)
Marital status				
Married	22.89 (21.03–24.87)	28.44 (26.42–30.55)	11.04 (9.68–12.56)	22.89 (21.03–24.78)
Single	40.94 (33.81–48.46)	42.11 (34.93–49.63)	20.47 (15.07–27.18)	40.94 (33.81–48.46)
Education years				
Illiterate	38.00 (34.20–41.96)	40.67 (36.80–44.65)	18.00 (15.13–21.28)	78.68 (75.20–81.76)
1–5	23.83 (20.52–27.48)	30.09 (26.47–33.97)	10.43 (8.19–13.21)	66.78 (62.83–70.52)
6–12	16.58 (13.82–19.77)	22.72 (19.55–26.24)	9.62 (7.51–12.24)	58.21 (54.23–62.09)
University	11.21 (7.74–15.95)	17.67 (13.28–23.13)	5.17 (2.96–8.89)	50.86 (44.45–57.25)
Economic status				
Poor	28.83 (25.75–32.12)	32.95 (29.73–36.33)	15.70 (13.31–18.43)	75.03 (71.87–77.95)
Moderate	23.24 (20.03–26.80)	30.27 (26.71–34.07)	10.20 (8.02–12.90)	62.54 (58.59–66.34)
Rich	19.87 (16.94–23.18)	24.96 (21.73–28.49)	8.74 (6.77–11.22)	57.55 (53.65–61.36)
BMI				
Normal weight	18.61 (15.45–22.25)	26.73 (23.05–30.77)	13.07 (10.40–16.30)	69.11 (64.94–72.99)
Over-weight	23.56 (20.81–26.56)	28.71 (25.74–31.87)	10.89 (8.95–13.18)	63.52 (60.19–66.72)
Obese	30.00 (26.62–33.61)	33.03 (29.54–36.71)	12.12 (9.84–14.84)	66.06 (62.36–69.58)
Cigarette smoking				
No smoker	25.97 (23.83–28.24)	29.80 (27.55–32.15)	11.80 (10.27–13.52)	66.38 (63.96–68.72)
Ex-smoker	23.27 (17.35–30.47)	26.42 (20.14–33.81)	8.81 (5.28–14.32)	62.26 (54.49–69.46)
Smoker	17.67 (13.85–22.26)	30.28 (25.47–35.57)	13.56 (10.21–17.80)	65.30 (59.89–70.34)
Illicit drug use				
No	25.43 (23.44–27.53)	29.52 (27.42–31.71)	11.85 (10.41–13.46)	66.46 (64.20–68.64)
Yes	17.65 (13.44–22.82)	30.20 (24.87–36.11)	11.76 (8.35–16.33)	61.96 (55.85–67.72)
Alcohol use				
No	25.46 (23.46–27.57)	29.85 (27.74–32.05)	11.78 (10.34–13.38)	66.74 (64.49–68.93)
Yes	17.56 (13.41–22.65)	27.86 (22.77–33.60)	12.21 (8.77–16.77)	60.31 (54.25–66.06)

CI: Confidence interval, BMI: Body mass index

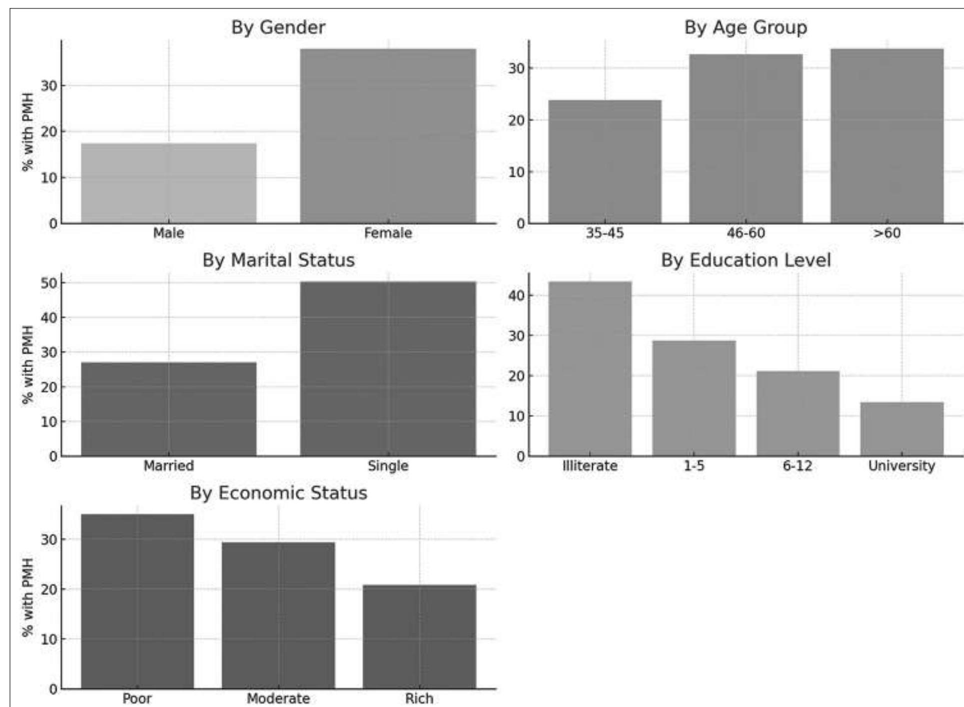

Figure 1: Prevalence of poor mental health by demographic

Table 3: Crud and adjusted odds ratio for poor mental health and its domains according to the demographic and socioeconomic correlates in participants in Dehgolan prospective cohort Study

Variables	Total OR (CI)		Somatic symptom OR (CI)		Anxiety/insomnia OR (CI)	
	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted
Sex (reference: Female)						
Male	0.34 (0.28–0.43)[c]	0.32 (0.23–0.45)[c]	0.42 (0.35–0.51)[c]	0.42 (0.32–0.55)[c]	0.52 (0.39–0.70)[c]	0.54 (0.35–0.84)[b]
BMI (reference: Normal weight)						
Over weight	1.04 (0.81–1.33)	0.86 (0.65–1.13)	0.78 (0.61–0.98)[a]	0.66 (0.51–0.85)[c]	1.10 (0.86–1.41)	0.75 (0.52–1.07)
Obese	1.42 (1.10–1.83)[b]	0.98 (0.74–1.31)	0.87 (0.68–1.11)	0.61 (0.46–0.81)[c]	1.35 (1.05–1.74)	0.74 (0.51–1.08)
Age (reference: 35–45)						
46–60	1.55 (1.26–1.91)[c]	1.31 (1.01–1.69)[a]	1.27 (1.04–1.54)[a]	1.09 (0.87–1.38)	1.55 (1.26–1.91)[c]	0.91 (0.64–1.31)
>60	1.63 (1.20–2.20)[b]	1.12 (0.76–1.65)	1.64 (1.21–2.24)[b]	1.03 (0.71–1.51)	1.25 (0.91–1.71)	0.95 (0.57–1.57)
Marital status (reference: Married)						
Single	2.73 (1.99–3.75)[c]	1.67 (1.18–2.36)[b]	2.60 (1.73–3.90)[c]	1.54 (1.00–2.37)[a]	2.07 (1.39–3.09)[c]	1.34 (0.87–2.09)
Education years (reference: Illiterate)						
1–5	0.53 (0.41–0.67)[c]	0.76 (0.57–1.00)	0.54 (0.42–0.71)[c]	0.75 (0.56–1.0)	0.53 (0.38–0.74)[c]	0.61 (0.41–0.90)[a]
6–12	0.35 (0.27–0.45)[c]	0.71 (0.50–1.00)	0.38 (0.29–0.49)[c]	0.67 (0.47–0.94)[a]	0.48 (0.34–0.68)[c]	0.62 (0.38–1.01)
University	0.20 (0.13–0.30)[c]	0.55 (0.33–0.93)[a]	0.28 (0.20–0.39)[c]	0.60 (0.39–0.94)[a]	0.25 (0.13–0.46)[c]	0.37 (0.17–0.80)[a]
Economic status (reference: Poor)						
Moderate	0.77 (0.61–0.97)[a]	0.97 (0.76–1.24)	0.55 (0.44–0.70)[c]	0.68 (0.53–0.87)[b]	0.61 (0.44–0.85)[b]	0.74 (0.52–1.04)
Rich	0.49 (0.38–0.62)[c]	0.73 (0.55–0.97)[a]	0.45 (0.36–0.57)[c]	0.64 (0.49–0.82)[c]	0.51 (0.37–0.72)[c]	0.79 (0.54–1.15)
Alcohol use (reference: No)						
Yes	0.76 (0.58–0.99)[a]	1.44 (1.00–2.06)[a]	0.76 (0.58–0.99)[a]	–	1.04 (0.70–1.55)	–
Cigarette smoking (reference: No smoker)						
Ex-smoker	0.87 (0.60–1.25)	1.29 (0.85–1.97)	0.83 (0.60–1.17)	1.16 (0.80–1.69)	0.72 (0.41–1.28)	0.93 (0.51–1.71)
Current smoker	0.83 (0.63–1.09)	1.68 (1.17–2.41)[a]	0.95 (0.74–1.23)	1.53 (1.13–2.06)[a]	1.17 (0.82–1.68)	1.92 (1.23–3.02)[a]
Illicit drug use (reference: No)						
Yes	0.85 (0.63–1.15)	–	0.82 (0.63–1.08)	–	0.99 (0.66–1.49)	–

Variables	Depression symptom OR (CI)		Social dysfunction OR (CI)	
	Crude	Adjusted	Crude	Adjusted
Sex (reference: Female)				
Male	0.45 (0.36–0.55)[c]	0.40 (0.29–0.54)[c]	0.27 (0.22–0.35)[c]	0.24 (0.17–0.35)[c]
BMI (reference: Normal weight)				
Over weight	1.10 (0.86–1.41)	0.95 (0.73–1.24)	1.35 (1.02–1.77)[a]	1.05 (0.78–1.42)
Obese	1.35 (1.04–1.74)[a]	1.02 (0.77–1.36)	1.87 (1.42–2.48)[c]	1.19 (0.87–1.62)
Age (reference: 35–45)				
46–60	1.55 (1.26–1.91)[c]	1.29 (1.00–1.66)[a]	1.80 (1.44–2.26)[c]	1.71 (1.30–2.26)[c]
>60	1.25 (0.92–1.71)	0.87 (0.59–1.29)	2.06 (1.50–2.83)[c]	1.89 (1.26–2.85)[b]
Marital status (reference: Married)				
Single	1.83 (1.33–2.52)[c]	1.33 (0.94–1.88)	2.33 (1.69–3.23)[c]	1.31 (0.92–1.87)
Education years (reference: Illiterate)				
1–5	0.63 (0.49–0.80)[c]	0.76 (0.58–1.00)	0.51 (0.40–0.66)[c]	0.84 (0.63–1.13)
6–12	0.43 (0.33–0.55)[c]	0.68 (0.48–0.97)[a]	0.32 (0.25–0.42)[c]	0.88 (0.60–1.28)
University	0.31 (0.21–0.45)[c]	0.62 (0.38–1.02)	0.21 (0.13–0.32)[c]	0.71 (0.41–1.25)
Economic status (reference: Poor)				
Moderate	0.88 (0.70–1.11)	1.03 (0.80–1.31)	0.75 (0.58–0.95)[a]	0.95 (0.73–1.24)
Rich	0.68 (0.53–0.85)[b]	0.93 (0.71–1.22)	0.61 (0.48–0.79)[c]	0.93 (0.69–1.24)
Alcohol use (reference: No)				
Yes	0.91 (0.68–1.21)	–	0.62 (0.44–0.87)[b]	1.39 (0.90–2.15)
Cigarette smoking (reference: No smoker)				
Ex-smoker	0.84 (0.58–1.22)	1.16 (0.76–1.76)	0.86 (0.59–1.27)	1.33 (0.85–2.08)
Current smoker	1.02 (0.79–1.33)	1.70 (1.18–2.43)[a]	0.61 (0.45–0.83)[b]	1.26 (0.82–1.93)
Illicit drug use (reference: No)				
Yes	1.03 (0.77–1.37)	1.46 (1.00–2.11)[a]	0.63 (0.45–0.88)[b]	1.13 (0.71–1.81)

[a]$P<0.05$, [b]$P<0.01$, [c]$P<0.05$. BMI: Body mass index, CI: Confidence interval, OR: Odds ratio

experience social dysfunction. During the pandemic, the rate of social dysfunction was reported to be more than 60%[27] and 79%[4] among nurses. Studies worldwide also show statistics ranging from 45% to 60%.[28] It appears that the prevalence of social dysfunction in Iranian society, as found in the present study, is higher, which can be attributed to various factors such as social, cultural, economic

conditions, and the level of education of the studied society. This finding underscores the need for public health interventions aimed at improving social cohesion, especially during crises such as the COVID-19 pandemic. Social support networks, community outreach programs, and educational campaigns on mental health literacy could help mitigate these high rates of social dysfunction.[29]

Furthermore, in this study, the prevalence of anxiety, somatic, and depression disorders was reported as 30%, 24%, and 12%, respectively. The prevalence of anxiety has been reported as 21% among nursing students,[16] 28% among the infertile population,[30] and up to 37% in the general population during the COVID-19 period,[31] with rates as high as 40% in Tehran.[18] These findings are consistent with a study conducted during the COVID-19 period in China, where the anxiety rate was 35%.[32] The same findings were reported in the United States, with a significantly lower prevalence rate of 15% compared to the results of the present study.[33] The high prevalence of anxiety in this study highlights the importance of developing public health policies focused on psychological support during times of crisis. Targeted mental health interventions, such as online counseling services, mobile mental health apps, and destigmatizing mental health treatment, could be valuable strategies in reducing anxiety rates, especially in areas with limited access to traditional mental health services.[34]

It appears that the prevalence of anxiety disorders in the present study can be attributed to several factors, including social, cultural, economic, health, psychological events, and the screening method. In previous studies, the prevalence of somatic disorders was reported to be 34% in Iran,[4] 27% among people over 18 years old,[35] and 39% in Australia.[36] Therefore, the prevalence of somatic disorders in the present study is lower than some studies conducted in other countries, and it seems that the prevalence of somatic disorders is high in the adult population worldwide. Given the high prevalence of somatic disorders in many countries, including Iran, healthcare systems should focus on integrated care models that address both physical and mental health needs, particularly for individuals with chronic illnesses or multiple comorbidities.[37] In previous studies, the prevalence of depression in Iran has been reported to range from 6% to 70%. A meta-analysis conducted in Iran revealed that over 59% of individuals experienced depression.[38] The prevalence of depression in Eastern Europe among people over 18 years old has been reported as 21%.[39] In contrast, the prevalence of depression in Australia[40] and India[41] is < 6%. The wide range of depression rates across different countries suggests that public health policies should not only address the general risk factors for depression but also adapt to specific regional needs. Tailored interventions, including community-based mental health programs and culturally appropriate therapies, should be considered to reduce depression rates across various populations.[42]

As reported in other studies in Iran and other countries, the prevalence of PMH is higher among women.[7,43] To address this disparity, public health policies must prioritize gender-sensitive mental health interventions that account for the unique social, cultural, and biological factors affecting women's mental health. These policies should aim at reducing stigma, enhancing access to mental health services, and providing support systems for women, particularly in low-income or rural areas.[44] This difference can be attributed to biological factors, environmental stress, and other social restrictions faced by women in society. In the present study, an inverse relationship between BMI and social dysfunction was identified, indicating that individuals with higher weight had fewer dysfunction. These results are similar to systematic studies conducted in Western countries, which have shown a significant positive relationship between overweight and mental health.[45] Conversely, studies in East Asia show that weight gain negatively affects mental health.[46,47] This difference can be explained by racial differences in BMI distribution or lifestyle disparities. For instance, the long and loose traditional clothing worn by women in Iran, especially among the Kurds, may conceal obesity and even encourage women to gain weight.[48] Higher weight makes the clothes look good in Kurdish women. Public health interventions focusing on promoting healthy lifestyles and addressing body image issues, particularly among women, could contribute to reducing mental health disorders associated with body image dissatisfaction.[49]

In the present study, the prevalence of PMH was more commonly reported among single individuals compared to marrieds. This finding is consistent with previous studies that have shown higher rates of mental health disorders among singles.[50,51] To address this, policies aimed at increasing social support and improving relationship-building programs for single individuals could help reduce the incidence of mental health issues among this group.[52]

Social support, marital satisfaction, and stable relationships are known to have a protective effect on mental health in marrieds.[53,54] The level of education also emerged as one of the influential factors in mental health, whereby a lower level of education was associated with a poorer mental health condition.[51] Individuals with higher education, who possess a better understanding of living conditions and the capacity to effectively address mental health challenges, along with timely access to psychological counseling, have experienced a certain reduction in the occurrence of psychological issues. Public health interventions that focus on improving education and promoting mental health awareness among lower-education groups could help reduce the negative impact of education on mental health.[44] The findings of the current study align with previous research, indicating that a low income can contribute to a deterioration in mental health.[51,55] Various studies indicate that economic resources, unemployment, and housing instability resulting from lower income can be considered significant factors contributing to the rise of PMH.[56]

Limitation

This study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design prevents us from establishing causal relationships between socioeconomic factors and PMH outcomes. Second, while the GHQ-28 is a validated screening tool, its self-reported nature may introduce response biases, including underreporting of sensitive behaviors (e. g., alcohol consumption) due to social desirability effects. In addition, as a screening instrument, it may yield different prevalence estimates compared to clinical diagnostic interviews. Third, our sample was limited to adults aged 35–70 years from a specific Kurdish region in Iran, which may affect the generalizability of results to younger populations and other geographic or ethnic groups.

CONCLUSIONS

The present study's findings indicate that the prevalence of mental health disorders in western Iran stands at 29%, which is notably higher compared to studies conducted within and outside the country. It is important to note the cross-sectional nature of this study and the uncertainty regarding the temporal relationship between variables, which calls for caution in interpreting the effect size values. Taking this limitation into account, similar to other studies in Iran and globally, women exhibited a higher prevalence of mental health disorders. Contributing factors to the increase in these disorders included low education level, low income, social and economic pressures, being single, smoking, and alcohol consumption. In addition, a negative correlation between BMI and social dysfunction was identified. Therefore, to mitigate PMH in western Iran, efforts should be made to enhance social and economic infrastructure and raise awareness and education levels regarding mental health among the population. Promoting physical health, reducing smoking and alcohol consumption, increasing access to physical and mental health services, and addressing the social and economic pressures faced by women are crucial steps to be taken. Special attention should also be given to individuals with low income, singles, and those with limited education to improve their living and working conditions.

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Author contributions

Farhad Moradpour: Conceptualization, Methodology, Study design, Writing – review & editing. Azad Shokri: Data curation, Formal analysis, Writing – original draft, Correspondence. Sina Fattahi: Investigation, Data collection, Writing – original draft preparation, Correspondence. Yousef Moradi: Supervision, Validation, Writing – review & editing.

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Conflicts of interest

There are no conflicts of interest.

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Burden and risk factors of early poststroke depression: A cross-sectional study

INTRODUCTION

Stroke is a leading cause of global morbidity and mortality, with ischemic stroke being the most common type. It often has neuropsychiatric sequelae such as depression, anxiety, and affective incontinence.[1,2] Of these diverse emotional and behavioral sequelae, poststroke depression (PSD) is the most common one, with a point prevalence of about 30%, and usually presents with anhedonia, psychomotor changes, changes in sleep, appetite, and suicidal ideation.[2] About 10%–25% of patients suffer from major depression, whereas mild depression accounts for about 10%–40% of cases.[3] Despite being widely recognized, PSD is usually left undiagnosed and untreated.[2] Studies indicate that symptoms of depression are most common in the 3rd month following a stroke, with the prevalence of PSD peaking between 3 and 6 months poststroke.[3] However, there is no consensus on the optimal timing for screening for PSD, as its prevalence varies across studies due to differences in assessment timing after a stroke and the scales used for measurement.

Global and Indian studies on risk factors for the development of PSD have yielded varied results. Al Qawasmeh *et al*. conducted a prospective study among 151 stroke survivors and found a prevalence of 24.83% at 1 month and 17.39% at 3 months poststroke using the PHQ-9 scale. Predictors for PSD included chronic kidney disease, smoking status, and initial disability.[4] In their case–control study, Khedr *et al*. identified low educational level, low socioeconomic status, smoking, and poststroke functional impairment as risk factors for PSD and no significant associations with age, gender, hypertension, diabetes mellitus, cardiac disease, or stroke lesion location, suggesting independent relationships with PSD.[5] The American Stroke Association recommends further studies to determine the effectiveness of screening and timely intervention for PSD and the specifications of the same.[6]

Saxena and Suman, in a study of 107 acute stroke patients, found 57% to have PSD. They found that lower socioeconomic status and left-sided hemisphere lesions were significantly associated with depression, while age, gender, education, and comorbidities showed no significant correlations.[7] Jana *et al*., in a study on elderly patients with stroke, used the PSD Rating Scale (PSDRS) and found significant associations between specific lesion locations – such as the parietal lobe and middle cerebral artery territory – and increased feelings of guilt. Diffuse and periventricular lesions, as well as those in the frontal or occipital lobes, correlated with higher rates of catastrophic reaction and emotional dysregulation.[8] Patra *et al*., in a meta-analysis of 15 Indian studies, found a pooled prevalence of PSD at 55%, with significant variability across different assessment tools. This Indian meta-analysis highlights the need for more rigorous and standardized approaches in assessing and addressing PSD to inform effective public health interventions.[9]

The greatest improvements in poststroke disability are typically observed in the initial weeks, with motor function often leveling off around 3 months.[10] Therefore, this period is critical, as depression during this time can substantially hinder recovery efforts. However, there is a dearth of studies on the prevalence and risk factors of PSD in this early phase, with most studies focusing on depression several months to a year following stroke. The use of scales specific to PSD in studies is also limited. This can contribute to poorer recovery, increased risk of recurrent vascular events, impaired cognition, poorer quality of life, higher mortality rates, and higher rates of suicide.[3,6] This cross-sectional study aimed to estimate the proportion and severity of PSD in the early phase, in the 1st month following stroke, and to identify factors contributing to its development.

SUBJECTS AND METHODS

Study design

This was a cross-sectional observational study conducted among inpatients admitted to the neurology wards of a tertiary care teaching hospital in Karnataka over 2 months in March and April 2023. The objectives of the study were (1) to estimate the proportion and severity of PSD in the acute phase, i.e. within the 1st month following stroke, (2) to identify the sociodemographic and clinical factors contributing to PSD, and (3) to evaluate the effectiveness of the PSDRS in screening for PSD.

Participants

We included male and female adult patients admitted with first or recurrent ischemic stroke, with the most recent stroke within the past month. Those patients in whom meaningful communication was impaired due to severe aphasia, cognitive impairment, hearing/visual impairment, those with a history of psychiatric illness, and those with uncontrolled medical comorbidities and end-stage organ failure were excluded from the study. The sample size of 23 was calculated using a single population proportion formula to estimate the prevalence of major depressive disorder (MDD) in the acute phase of stroke, which was the primary aim of the study. Parameters included a prevalence of 5.6%[11] with a 90% confidence level ($Z = 1.645$), and a margin of error of 8%. The formula used was $n = Z^2 \times p\,(1 - p)/d^2$, yielding $n \approx 22.35$, which was rounded up to 23. While the sample size was not originally calculated to detect group differences, a *post hoc* analysis of PSDRS total scores – our key comparative measure – yielded a large observed effect size (Cohen's $d = 4.97$). Fifty participants were screened, and 34 participants were included in the study, selected using the purposive sampling method. Ethical clearance was obtained from the institutional ethics committee before the commencement of the study. Written informed consent was taken from each participant.

The STROBE cross-sectional reporting guidelines were used.[12] The study was conducted as per the ethical standards of the institute and the Helsinki Declaration.

Tools

Face-to-face interviews were conducted with the study participants, and data were collected using a structured pro forma to capture sociodemographic details and clinical profiles. The Glasgow Coma Scale was used to exclude participants with impaired consciousness, with a score of <15 serving as the exclusion criterion. The mini–mental status examination was utilized to exclude patients with cognitive impairment, applying a cutoff score of <18 for exclusion to omit participants with moderate-to-severe cognitive impairment. This threshold was chosen to ensure that included participants could reliably engage in the interview process and respond meaningfully to mood-related assessments. The diagnosis of PSD was made using the ICD-10 diagnostic criteria, based on a structured clinical interview. Patients were evaluated as early as 1 week poststroke, with a focus on the early poststroke period. As the ICD-10 criteria require a minimum symptom duration of 2 weeks, those identified within the 1st week were re-evaluated after an additional week to confirm the diagnosis. In addition, the participants were assessed using the PSDRS, a diagnostic tool specifically designed for evaluating PSD, known for its good sensitivity and specificity. This scale considers the neurological and cognitive deficits that may accompany stroke-related depression.[13] No cutoff score was applied to the PSDRS; instead, PSDRS scores were used to quantify the severity of depressive symptoms and compare symptom profiles between those diagnosed with depression and those without. The National Institutes of Health Stroke Scale (NIHSS), a 15-item scale, was used to evaluate the severity of neurological deficits following a stroke.[14] Magnetic resonance imaging/computed tomography brain scans, performed as part of the diagnostic evaluation of stroke, were used to classify the stroke lesion as ischemic or hemorrhagic, left or right hemisphere, and cortical or subcortical. Hematological investigations conducted as part of stroke evaluation were obtained from hospital records to determine values of inflammatory markers, including total white blood cell (WBC) counts, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), and red cell distribution width (RDW). To reduce selection bias, all consecutive patients admitted to the neurology department during the study were screened for eligibility using uniform inclusion and exclusion criteria. Observer bias was mitigated using structured clinical interviews for the diagnosis of depression based on ICD-10 criteria, conducted by trained clinicians. Participants diagnosed with depression were referred for psychiatry consultation and provided appropriate treatment as indicated.

Statistical analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS for Windows, Version 16.0. SPSS Inc., Chicago, IL, USA). Descriptive statistics were reported as mean and standard deviation (SD) for continuous variables, along with their range, and as frequency and percentage for ordinal and nominal variables. Group comparisons were conducted using the Chi-square test, *t*-test, and Fisher's exact test. A $P < 0.05$ was considered statistically significant. Laboratory and clinical data were manually reviewed, and participants with missing values for core clinical or laboratory variables were excluded from the respective analyses.

RESULTS

A total of 50 patients with ischemic stroke were screened, 16 were excluded based on the specified criteria, and 34 patients were included in the study. The study group consisted of 20 (58.82%) males and 14 (41.18%) females with an age range of 45–82 years, with a mean age of 63.41 (SD 9.73) years. The sociodemographic data and comorbidities of the participants are presented in Table 1.

Table 2 describes the clinical profile and neuroimaging findings of the patients. The mean number of comorbidities was 1.76 (SD 1.16). Thirteen out of 34 (38.24%) had suffered from a minor stroke, and 21 (61.76%) had a moderate stroke according to the NIHSS. The mean NIHSS score was 5.91 (SD 2.67).

Laboratory values collected were WBC count, ESR, and CRP levels at the time of admission. However, these data were not available for all the participants, and it was analyzed by excluding the missing variables. The values of the inflammatory markers are presented in Table 3.

Based on the ICD-10 diagnostic criteria, 9 participants (26.47%) were diagnosed with depression in the acute phase following stroke. Among these, 17.65% of the participants had mild depression, and 8.82% had moderate depression. None of the participants had severe depression. The mean duration at which the participants were screened for PSD was 7.12 (SD 4.45) days. Table 4 shows the PSDRS scores and subscores of the participants.

Based on our diagnosis, the participants were divided into two groups: those with PSD and those without PSD. We compared the sociodemographic variables, clinical variables, PSDRS total score, subscores, and laboratory variables between the two groups. There were no statistically significant differences in age, gender, education status, employment status, comorbidities, mean duration at evaluation, or mean NIHSS score between participants with and without PSD. Participants with depression had significantly higher total PSDRS scores compared to those without depression (mean difference = 15.64, 95% confidence interval [CI]: 13.16–18.13; $P < 0.001$). The effect size for this difference was large (Cohen's $d = 4.97$), indicating a strong distinction between groups. Similar statistically significant differences were observed across all PSDRS subscores, with nonoverlapping CIs and large mean differences [Table 4]. The group with depression had a higher percentage of those with greater severity of stroke, recurrent stroke, and subcortical infarct, and the presence of other brain changes on neuroimaging [Table 2]. However, these differences were not statistically significant. There were no statistically significant differences between the mean value of laboratory variables of WBC count, ESR, or CRP between the two groups [Table 3].

DISCUSSION

This cross-sectional observational study aimed to estimate the proportion of PSD in the early phase following stroke within 1 month of the cerebrovascular event and to identify risk factors contributing to PSD. We found the proportion of PSD in the acute phase following stroke to be 26.47%. A cross-sectional study done by Berg *et al*. investigated the prevalence of PSD in the first 2 weeks following the first ischemic stroke among 100 patients and found a prevalence of MDD of 5.6%, with 27% meeting mild depression according to the Beck Depression Inventory (BDI) score.[11] The proportion identified in our study follows a similar trend, with 17.65% of the participants having mild depression and 8.82% having moderate depression. The proportion in the current study is lower than that reported for PSD in most studies, which is reported to be about 33%. This difference is due to the restriction of the study to 1-month poststroke, as PSD is commonly seen to develop 3–6 months following stroke, with a maximum prevalence about 1 year after stroke.[6] Our study focused on the acute phase following stroke and evaluation of PSD in that period, whereas most literature on PSD has reported prevalence only several months (3–6 months) after stroke, with research in the acute phase being limited. The presence of depressive symptoms and MDD in this phase can significantly impair the recovery and quality of life of these individuals, and timely screening and intervention for the same is indicated. Screening for depressive symptoms during the early stages can lead to better therapeutic outcomes for such individuals. Most of the studies on PSD have used scales such as the Beck Depression Inventory and Hamilton Depression Rating Scale, with relatively fewer studies using the PSDRS, although it has been validated for PSD.[13] The PSDRS was effective for the evaluation of both depressive symptoms specific to those following stroke as well as the severity of PSD, as there was a statistically significant difference between the two groups in the total PSDRS score as well as each of the individual subscores. The PSDRS is not widely used clinically. However, the results of our study indicate that it is a useful tool for the identification of PSD even in the acute phase following stroke. We also found that depressed mood and difficulty in emotional control were present with a greater severity compared to other symptoms in the PSDRS, even in individuals without PSD. This indicates the possibility that, despite not meeting the criteria for MDD, patients following stroke suffer from isolated symptoms such as the above, which can lead to significant impairment in their personal and social lives and might need targeted interventions.

There were no statistically significant differences in the sociodemographic data between the groups with and without PSD, which signifies that risk factors such as female gender and low educational status, which contribute to MDD in the general population, may not play a significant role in PSD. There was no statistically significant difference in the number of comorbidities or the severity of stroke as per the NIHSS between the groups. Within this cohort of patients with minor-to-moderate strokes, PSD did not appear to be related to comorbid medical conditions or stroke severity. Nevertheless, since patients with very severe impairment were excluded, this association cannot be ruled out in the broader stroke population. Although the depression group had a higher percentage of those with left-sided infarcts, subcortical infarcts, and other neuroimaging changes such as small vessel ischemic changes, these associations were not statistically significant. There was also no association between infarct size and PSD. The above findings point to a more independent relationship between stroke and depression not attributed to the lesion location, infarction size, and vascular depression hypotheses. The findings favor the recent hypotheses correlating stroke and depression, such as the neurotransmitter, hippocampal neurogenesis, immune dysfunction, and HPA axis dysfunction following stroke, predisposing to PSD, although we could not further explore

Table 1: Sociodemographic variables and comorbidities among the whole group, participants with poststroke depression and participants without poststroke depression, respectively

Variable	Whole group (*n*=34), *n* (%)	Depression (*n*=9), *n* (%)	No depression (*n*=25), *n* (%)	*P*
Gender				
Male	20 (58.82)	7 (77.78)	13 (52)	0.25
Female	14 (41.18)	2 (22.22)	12 (48)	
Education				
Not formally educated	4 (11.76)	2 (22.22)	2 (8)	0.096
Primary school	10 (29.41)	2 (22.22)	8 (32)	
Middle school	10 (29.41)	4 (44.44)	6 (24)	
High school	8 (23.53)	0	8 (32)	
Higher secondary	1 (2.94)	0	1 (4)	
Graduate and above	1 (2.94)	1 (11.11)	0	
Employment status				
Employed	11 (32.35)	3 (33.33)	8 (32)	0.99
Unemployed	0	0	0	
Retired	15 (44.12)	4 (44.44)	11 (44)	
Homemaker	8 (23.53)	2 (22.22)	6 (24)	
Hypertension				
Yes	27 (79.41)	8 (88.89)	19 (76)	0.644
No	7 (10.59)	1 (11.11)	6 (24)	
Diabetes				
Yes	20 (58.82)	4 (44.44)	16 (64)	0.435
No	14 (41.18)	5 (55.56)	9 (36)	

Table 2: Stroke-related clinical variables and neuroimaging findings among the whole group, participants with poststroke depression and participants without poststroke depression, respectively

Variable	Whole group (*n*=34), *n* (%)	Depression (*n*=9), *n* (%)	No depression (*n*=25), *n* (%)	*P*
Number of stroke				
First	28 (82.35)	6 (66.67)	22 (88)	0.306
Recurrent	6 (17.65)	3 (33.33)	3 (12)	
Severity of stroke				
Minor	13 (38.24)	1 (11.11)	12 (48)	0.107
Moderate	21 (61.76)	8 (88.89)	13 (52)	
Side of infarct				
Right	22 (64.71)	5 (55.56)	17 (68)	0.687
Left	12 (35.29)	4 (44.44)	8 (32)	
Site of infarct				
Cortical	7 (20.59)	1 (11.11)	6 (24)	0.317
Subcortical	16 (47.06)	7 (77.78)	9 (36)	
Cortical and subcortical	2 (5.88)	0	2 (8)	
Brainstem	9 (26.47)	1 (11.11)	8 (32)	
Other changes	19 (55.88)	6 (66.67)	13 (52)	0.726
Cerebral atrophy	10 (29.41)	4 (44.44)	6 (24)	
Small vessel ischemic changes	14 (41.18)	5 (55.56)	8 (32)	

Table 3: Inflammatory markers among the whole group, participants with poststroke depression and participants without poststroke depression, respectively

Variable	Whole group (*n*=34), *n* (%)	Depression (*n*=9), *n* (%)	No depression (*n*=25), *n* (%)	*P*
ESR	*n*=14	*n*=4	*n*=10	
High	8 (57.14)	1 (25)	7 (70)	0.914
Normal	6 (42.86)	3 (75)	3 (30)	
WBC count	*n*=31	*n*=9	*n*=22	
High	6 (19.35)	1 (11.11)	5 (22.72)	0.832
Normal	25 (80.65)	8 (88.89)	17 (77.27)	
CRP	*n*=11	*n*=3	*n*=8	
High	5 (45.45)	2 (66.67)	3 (37.5)	0.682
Normal	6 (54.54)	1 (33.33)	5 (62.5)	

ESR: Erythrocyte sedimentation rate, CRP: C-reactive protein, WBC: White blood cell

Table 4: Poststroke Depression Rating Scale total score and individual sub-scores among the whole group, participants with poststroke depression and participants without poststroke depression, respectively

Variable	Whole Group	Depression	No depression	Mean difference	95% CI	*P*
PSDRS score (out of 45)	7.94±7.66	19.44±3.81	3.8±2.89	1.53	0.84–2.22	<0.001
1 (depressed mood)	1.21±0.88	2.33±0.87	0.8±0.41	2.12	1.07–3.17	<0.001
2 (guilt feelings)	0.88±1.25	2.44±1.33	0.32±0.56	1.50	0.64–2.36	<0.001
3 (suicide)	0.68±0.94	1.78±1.09	0.28±0.46	1.51	0.58–2.44	<0.001
4 (vegetative disorders)	1±1.02	2.11±1.16	0.6±0.58	2.39	1.89–2.89	<0.001
5 (apathy/abulia/indifference)	0.91±1.24	2.67±0.5	0.28±0.68	1.82	1.02–2.62	<0.001
6 (anxiety)	0.88±1.09	2.22±0.97	0.4±0.65	1.39	0.95–1.83	<0.001
7 (catastrophic reaction)	0.53±0.75	1.55±0.53	0.16±0.37	1.17	0.32–2.02	<0.001
8 (difficulty in emotional control)	1.02±0.9	1.89±1.05	0.72±0.61	2.20	1.59–2.81	<0.001
9 (anhedonia)	0.82±1.14	2.44±0.73	0.24±0.53	0.62	0.24–1.00	<0.001
10 (diurnal variations)	0.32±0.47	0.78±0.44	0.16±0.37	0.60	0.19–1.01	<0.001

PSDRS: Poststroke Depression Rating Scale, CI: Confidence interval

these associations.[15,16] The association between laboratory inflammatory markers and PSD was evaluated using the values of WBC counts, CRP, RDW, and ESR at the time of admission. The group with PSD had a higher percentage of those with elevated CRP levels, although it was not statistically significant. Our approach to studying this association was also limited, as the above markers were not available for all the participants. The role of inflammation and genetic polymorphisms leading to the activation of inflammatory cell lineages contributing to PSD has been proposed by several studies.[16] Dai *et al*. conducted a retrospective study on 185 patients with ischemic stroke and found that patients with PSD had an increased RDW compared to those without PSD. Their study demonstrated raised RDW and IL-6 as independent predictors of PSD.[17] Kowalska *et al*. explored the association between CRP and PSD and found that higher levels of CRP were associated with greater depressive symptoms in the acute phase after stroke, with no significant correlation with depression at 3 months poststroke.[18]

The proportion of PSD and the findings that there were no significant underlying risk factors in the sociodemographic and clinical domains in our study indicate that PSD is a condition that needs to be screened in all individuals who have suffered from a

stroke, irrespective of the time since the stroke. One of the key limitations of this study is the relatively small sample size. While it was adequate for estimating the prevalence of PSD, it may not have been sufficient to detect more subtle associations. The modest number of participants, particularly in the PSD group, limits the generalizability of our findings to broader stroke populations and introduces the possibility of Type II error in nonsignificant comparisons. Although *post hoc* analysis suggested adequate power for the observed PSDRS score difference, these results should be interpreted cautiously due to the limited sample and single-center design. Larger, multi-center studies are needed to validate these preliminary findings and better characterize early PSD across diverse clinical settings. Another potential limitation is the broad age range of participants (45–82 years), which could introduce heterogeneity in the pathophysiology of PSD, potentially affecting the generalizability of the results across different age groups. In addition, the assumption of uniformity in PSD across this diverse age range may not fully account for age-related differences in the presentation and progression of the disorder, potentially influencing the study's overall conclusions. Other limitations were the unavailability of laboratory values for all patients and the study not accounting for the specific site of the infarct, which may play a significant role in the development and severity of PSD.

Further studies are recommended to understand the associations with underlying biological mechanisms like inflammation, to identify specific biomarkers that might predict the risk for PSD, and to explore the role of anti-inflammatory and antioxidant therapies. Future research should aim to better capture age-related differences in PSD to address the potential heterogeneity across age groups. In addition, incorporating the specific site of the infarct in the analysis would provide deeper insights into its role in the pathophysiology and severity of PSD.

CONCLUSION

This study demonstrates that post-stroke depression is present in a substantial proportion of patients even within the first month following an ischemic stroke. The absence of significant sociodemographic, clinical, or neuroimaging correlates in this early phase suggests that PSD may arise from mechanisms independent of conventional risk factors and stroke characteristics. The Post-Stroke Depression Rating Scale proved to be a sensitive tool for detecting both syndromal depression and subthreshold depressive symptoms in the acute post-stroke period. These findings underscore the importance of routine early screening for depressive symptoms in all stroke survivors, as timely identification and intervention may improve functional recovery and quality of life. Larger multi-center longitudinal studies are warranted to further elucidate underlying biological mechanisms and refine early predictive markers of PSD.

Authors Contribution

Parinitha Maben contributed to the conception and design of the study, intellectual content, literature search, data acquisition, data analysis, manuscript preparation, manuscript editing, manuscript review, and acted as guarantor. Siddharth Shetty contributed to the conception and design of the study, intellectual content, manuscript editing, and manuscript review. Vimala Colaco contributed to the conception and design of the study, intellectual content, and manuscript editing, and manuscript review.

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Conflicts of interest

There are no conflicts of interest.

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Case Report

Acceptance and commitment therapy for improving body esteem and psychological flexibility in women with polycystic ovary syndrome: Twin case report

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Abstract

Reproductive health is an integral part of women's life, and fertility is considered a sign of good health. Conditions associated with reproductive health, such as polycystic ovary syndrome (PCOS), exacerbate psychological distress. It involves hormonal imbalances and is supposedly the leading cause of infertility. Psychological distress often reported by such women includes depression, anxiety, stress, body image issues, eating disorders, low self-esteem, and poor quality of life. Psychotherapeutic intervention following the cognitive behavioral framework is beneficial in addressing these issues. The present study intends to explore the role of Acceptance and Commitment Therapy (ACT) in improving psychological flexibility and body esteem in women with PCOS. Individual sessions of ACT were implemented on two undergraduate female students, one overweight and another with normal Body Mass Index,suffering from PCOS since last 3-5 years, living in Kolkata, presenting with appearance-related concerns and emotional dysregulation. The questionnaires administered before and after intervention were the Acceptance and Action QuestionnaireII and Body Esteem Scale Revised. Five weekly sessions of therapy, each lasting for 45–50 min were held. The sessions emphasized on clarifying values and identifying hindrances in attaining the same. follow-up session was held after a month. After the intervention, an increase in psychological flexibility and improvement in body esteem, particularly in the areas of weight concern and physical condition, were observed for both participants.Interventions based on the third wave of behavior therapies, particularly ACT might help women with PCOS to accept their condition and motivate them to commit toward engaging in a healthier and meaningful life.

Keywords: Acceptance and commitment therapy, body esteem, polycystic ovary syndrome, psychological flexibility

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INTRODUCTION

Polycystic ovary syndrome (PCOS) is a commonly prevailing disorder characterized by hormonal imbalances, especially hyperandrogenism, that significantly impact women's health. The symptoms of PCOS include oligoovulation or anovulation, hyperandrogenism, and polycystic ovaries according to the Rotterdam criteria.[1] Other clinical features include irregular periods, weight gain, hirsutism, and acne, which in turn predispose women to experience mental health issues. Psychological distress often reported by such women includes depressive features, worry and negative apprehension, stress, issues with body image perception, disordered eating behaviors, low self-esteem, and a poorer quality of life.[2] It is one of the leading causes of infertility. It affects nearly 8%–13% of women worldwide belonging to the reproductive age group. The etiology of PCOS is unknown, and hence it cannot be cured; however, the symptoms can be managed by incorporating lifestyle modifications, pharmacotherapy, and fertility treatments.

The PCOS Society of India advises providing psychological help, i.e., counseling and psychotherapy, in addition to treating symptoms and insulin resistance in the treatment of PCOS. Psychotherapeutic management seems to be necessary for addressing the following problems – erratic behavior, abnormal eating patterns, diminished self-concept due to acne, obesity and hirsutism, and negative apprehension and rumination. Psychotherapy as an adjunct to pharmacotherapy is beneficial in managing psychological distress experienced by women suffering from PCOS. Several studies have been conducted to demonstrate the efficacy of psychotherapy as an adjunct treatment of PCOS. Cognitive behavior therapy (CBT) is widely used to address negative thought processes that perpetuate negative mood states or problematic behavior and has been proven to be helpful for women with PCOS. It has been proven to be efficacious in alleviating depression and improving the quality of life in individuals with PCOS.[3,4] Acceptance and commitment therapy (ACT) is particularly beneficial

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for PCOS due to its focus on psychological flexibility and acceptance, aligning behaviors with core values of the individual. It has been observed to be beneficial in improving body image and self-esteem immediately and a month after intervention in individuals with PCOS compared with controls in a study conducted by Moradi *et al*.[5] Evidence shows that even a brief intervention for 6 weeks based on ACT can lead to improvement in depressed clients.[6,7] In addition, interventions based on mindfulness, which is a component of many of the third wave of behavioral therapies, have been effective in ameliorating stress, anxiety, and depression in women with PCOS.[8,9]

Body esteem refers to the overall evaluation of one's body. Body image disturbances and consequent negative evaluation of one's body are widespread in women with PCOS owing to obesity, hirsutism, acne, and alopecia. This is accompanied by intense distress in personal, occupational as well as social spheres, as it becomes very difficult for them to fit in when they do not feel comfortable in their own bodies. Indeed, greater levels of body dissatisfaction are reported in women with PCOS.

Psychological flexibility acts as a protective factor against negative emotions, and it also promotes well-being. It is the capacity to be in the present moment and accept one's thoughts, feelings, and sensations nonjudgmentally. The opposite of it, i.e., psychological inflexibility leads to experiential avoidance, and it might pull individuals away from leading a life aligned with their values. The core task of ACT is to enhance psychological flexibility through the practice of mindfulness, expansion practice, and help individuals commit to lead a meaningful life aligned with their values.[10] It is expected that practicing these exercises will help women with PCOS to accept as well as appreciate themselves in their own bodies and embrace a healthier lifestyle aligned with their values.

The focus of the case studies discussed in this paper is to explore the role of ACT in improving psychological flexibility and body esteem in women with PCOS.

CASE REPORT

Two participants, A and B, aged 21 years and 19 years, respectively, Bengali-speaking, unmarried, pursuing graduation, belonging to middle socio-economic status, residing in semi-urban areas in Kolkata, were selected (details in Table 1).

Tools

Acceptance and action questionnaire-II (AAQ-II) developed by Bond *et al*. was used to measure psychological flexibility, i.e., an individual's ability to cope with, accept, and adjust to difficult situations.[11] It has 7 items with 7 response categories ranging from "Never true" to "Always true" in which the responses given to all the items are added up, and higher total scores mean less flexibility, while lower total scores mean more flexibility.

Body esteem scale-revised (BES-R) by Frost *et al*. has 28 items in which body parts and functions are listed, and there are 5 response categories which range from "have strong negative feelings" to "have strong positive feelings."[12] Body esteem refers to the evaluation of the body. For women, there are 3 subscales, i.e., sexual attractiveness, weight concern, and physical condition. Low scores in each subscale indicate negative feelings, and higher scores indicate positive feelings.

Intervention

Based on the history and symptomatology, a brief plan for counseling was devised, consisting of five weekly individual sessions and 1 month follow-up [Table 2]. Subjective unit of distress (SUD) was recorded for sessions 2–5 [Figure 1]. The worksheets used during counseling sessions have been downloaded for free from the website of Collins and Harris[13] (www.actmindfully.com.au).

The six core therapeutic processes of ACT are as follows:

a) Contacting the present moment – Being psychologically present through the process of mindfulness
b) Cognitive Defusion – To "step back" and detach from our thoughts, images, and memories, considering them as just thoughts and not absolute reality
c) Acceptance – Expanding awareness and making space for painful sensations, urges, and emotions, and allowing them to be as they are
d) Self-as-context – The observing self (pure awareness)
e) Values – To know what truly matters
f) Committed Action – Taking effective action guided by one's values.

Incorporating the components of mindfulness, cognitive defusion, acceptance, and values with cognitive restructuring may have beneficial effects on the psychological outcomes of PCOS. Accepting themselves as they are may not only diminish their struggle with body dissatisfaction but also encourage women with PCOS to adopt a healthier lifestyle.

Rapport was established in the first session, and assessment was conducted. Following this, CBT-based psychoeducation was provided, i.e., how our thoughts and emotions influence behavior. Participants were also familiarized with psychological distress in women with PCOS and how acceptance and commitment-based counseling can help deal with this condition. Acceptance means accepting the condition without judgment, and commitment indicates commitment toward engaging in activities aligned with one's values. In addition, behavioral activation, i.e., encouraging the participant to engage in pleasurable and meaningful activities according to a fixed schedule, was implemented.

Values, i.e., what really matters to the participant, were noted, and mindfulness practice was introduced in the second session and continued in subsequent sessions. The participant was also encouraged to dissect the problem according to the following format and note it down in four columns in session as well as between sessions (entanglement with thoughts, life-draining actions, struggle with negative feelings, and avoiding challenging situations). The participants were introduced to expansion practice, i.e., expanding awareness and allowing space for difficult feelings, urges, and sensations, and thereby allowing them to flow through them without hassle.

Identification of problems, values, and distractions was considered for the third session. The participant was encouraged to explore what

perpetuates her struggle and suffering by identifying problematic thoughts and feelings, and problematic actions. In addition, they recalled the values stated by them earlier, and a discussion was held on what can be done to help them align their behaviors with their values. How they tried to distract themselves from painful thoughts and feelings, and whether it helps or hinders progress, were also discussed, and whether these distraction strategies cost them in terms of health.

The fourth session focused on overcoming F-Fusion, E-Excessive goals, A-Avoidance of discomfort, R-Remoteness from values and providing an antidote D-Defusion, A-Acceptance of discomfort, R-Realistic goals, E-Embracing values.

The fifth session focused on developing willingness and an action plan in which the participant was encouraged to review her goal, core values, the actions required to achieve the goals, and the adjustments required to reach the same.

Re-assessment was conducted in the last session, i.e., the 5th session, and feedback from the participants was taken.

Table 1: The sociodemographic and clinical details of the participants

	Participant A	Participant B
Age (years)	21	19
Duration of PCOS (years)	>3	5
Medications	Not under medications currently	Presently under medications
Height, weight (kg)	5’9”, 81	5’, 46
BMI	26.4 (overweight)	19.8 (Normal)
Presenting complaints	Issues related to body weight and appearance, mood swings	Low mood, tendency to worry, difficulty regulating emotions

BMI: Body mass index, PCOS: Polycystic ovary syndrome

Table 2: Session-wise agenda of the intervention

Session	Agenda
1	Rapport establishment, assessment (AAQ-II, BES-R), CBT-based psychoeducation, behavioral activation (if needed), teaching the concepts of acceptance and commitment
2	Mindfulness practice; values (what really matters to the individual); dissecting the problem
3	Problems and values (identifying problematic thoughts, feelings and actions, and also the values and goals to live a rich and meaningful life; identifying distractions; Expansion practice (opening up and making space for difficult feelings and urges); Struggling versus opening up; mindfulness practice
4	Overcoming FEAR Antidote DARE
5	Willingness and action plan; Assessment (to check progress); feedback from participants
6 (1-month follow up)	Review of skills learned

DARE: Defusion, Acceptance of discomfort, Realistic goals, Embracing values, FEAR: Fusion, Excessive goals, Avoidance of discomfort, Remoteness from values, AAQ-II: Acceptance and Action Questionnaire-II, BES-R: Body Esteem Scale-Revised, CBT: Cognitive behavior therapy

In the follow-up session after a month, i.e., the 6th session, the skills learned and practiced in the therapy sessions were reviewed.

The baseline as well as postintervention measures were taken using the AAQ-II, and the BES-R. The SUD and the assessment measures are graphically represented.

DISCUSSION

The aim of the case studies discussed in this paper is to explore the role of ACT in improving psychological flexibility and body esteem in women with PCOS. The intervention comprised five sessions and 1-month follow-up. The baseline as well as postintervention measures were taken using the AAQ-II, and the BES-R. It is evident from the graphical representation [Figure 2] that there has been a decrease in the AAQ-II scores of both participants, implying an increase in psychological flexibility following intervention. The total score in AAQ-II ranges from 7 to 49, and a lower total score is suggestive of more flexibility. The scores obtained by participant 1 in the 1st and 5th sessions were 31 and 20, respectively, and those of participant 2 in the 1st and 5th sessions were 42 and 28, respectively.

In the BES, the scores on all the three subscales, i.e., sexual attractiveness, weight concern and physical condition for participant 1 [Figure 3] increased after intervention suggesting an increase in body esteem and that of participant 2 [Figure 4] also increased for the subscales weight concern and physical condition, however, the score on sexual attractiveness remained the same for her. The scores on sexual attractiveness remained in the “Average” range for both the participants before and after the intervention. The weight concern score of participant 1 was “Low” before intervention, and it was found to be “Average” after intervention. Participant 2 was found to be “Average” and “High” before and after intervention, respectively. The scores on physical condition for participant 1 were found to be “Low” and “Average” before and after intervention, respectively, and that of participant 2 remained in the “Average” range, although the score postintervention was greater than the preintervention score. The findings indicate that ACT indeed holds promise in improving body esteem and psychological flexibility in women with PCOS. Previous studies have shown that enhancement in psychological flexibility can predict improvement regarding body image concerns.[14] However, no study has been conducted so far by equating psychological flexibility with body esteem in women with PCOS.

Excerpts from the therapy session are given in Table 3.

CONCLUSION

Thus, it is evident that ACT helps improve psychological flexibility and body esteem in women with PCOS, which subsequently might help them in accepting and living with PCOS while helping them to adopt healthier alternatives to cope with the condition.

Limitations and future directions

The details of two cases have been discussed in the present paper. Implementing the intervention to a larger number of participants would have helped in the generalization of the findings. Nevertheless, the third wave of behavioral therapies indeed proves to be a promising

Table 3: Excerpts from therapy session

	Participant 1	Participant 2
Defusion	I'm thankful to myself and my mind that I felt those unpleasant feelings, it made me feel alive	Acknowledging painful thoughts about reproductive health
Acceptance of discomfort	It was tough making room for the feelings but gradually I became accustomed with the pain	It is painful but gradually it helps me feel in control of my emotions
Realistic goals	Exercising regularly and not to give up if I miss exercising for 2–3 days due to exams	Continue with carbohydrate-free diet and exercise as recommended by the physician
Embracing values	All I have to do is taking care of my health, my career, and my relationships	My health and my relationship with my partner matters to me the most

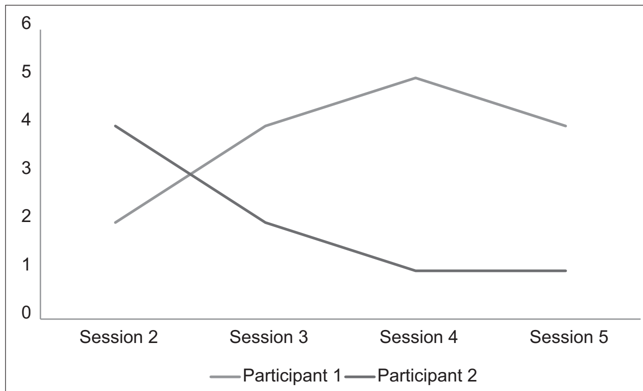

Figure 1: Graphical representation of the subjective unit of distress of the participants from sessions 2–5

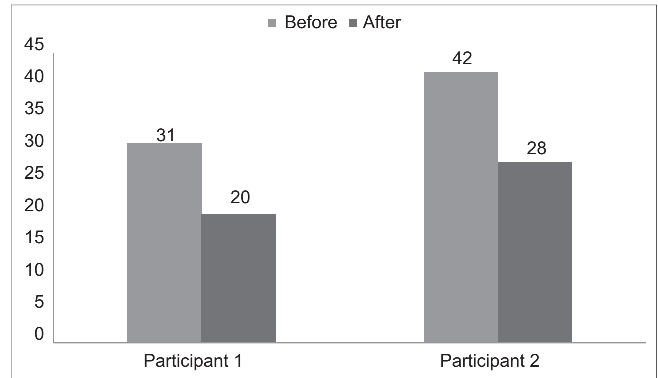

Figure 2: Graphical representation of acceptance and action questionnaire-II scores of the participants (baseline and postintervention)

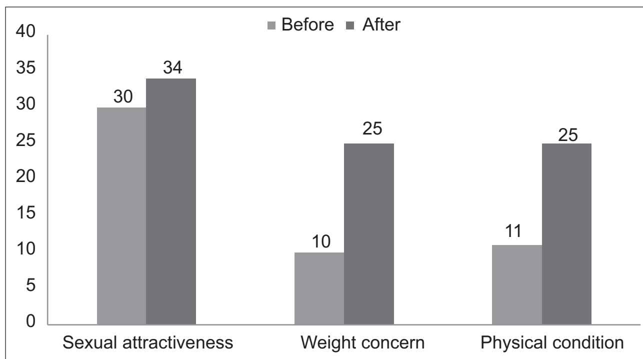

Figure 3: Graphical representation showing body esteem scale-revised scores of participant 1 (baseline and postintervention)

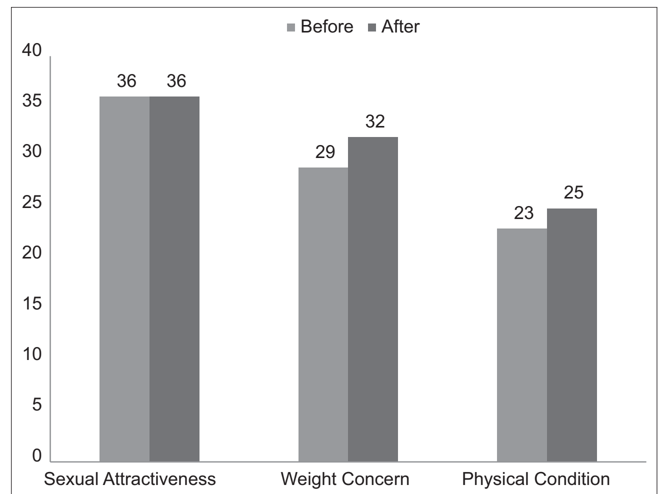

Figure 4: Graphical representation showing body esteem scale-revised scores of participant 2 (baseline and postintervention)

avenue for managing psychological distress in women with PCOS and facilitating them toward embracing a more meaningful and values-oriented lifestyle. Future studies may be carried out by implementing 8 or 12 sessions of psychotherapy based on ACT or compassion-focused therapy to find out whether the therapeutic techniques are helpful in managing psychological distress associated with PCOS.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published, and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Ethics statement

Consent to participate: Informed consent was obtained from all the participants in the study. Participation in the study was voluntary, and no risks were involved. It was also stated that they could withdraw anytime if needed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to restrictions, for example, their containing information that could compromise the privacy of the participants involved in the research.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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Case Report

Visual hallucinations in the context of psychosis and focal seizures

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Abstract

We report a case of a 72-year-old male who, after traumatic brain injury (TBI), presented with a sudden onset of behavioral abnormalities and well-formed visual hallucinations (episodic) that were primarily present on his left side of vision. He was initially referred to psychiatry, as his symptoms were thought to be a behavioral sequela of TBI. However, the visual hallucinations warranted further investigation. Further evaluation revealed that the hallucinations were secondary to seizures triggered by the TBI. While behavioral issues and seizures post-TBI are documented, this case is unique for presenting both psychiatric and neurological symptoms. The dilemma regarding the origin of his hallucinations was resolved by video electroencephalogram monitoring, confirming they were seizure-related rather than just post-TBI behavioral sequelae. His hallucinations were completely resolved with antiseizure medications. This highlights the challenges in diagnosing and managing visual hallucinations, stressing the need for a multidisciplinary approach to avoid misdiagnosis and ensure effective treatment.

Keywords: Psychosis, seizures, traumatic brain injury, visual hallucinations

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INTRODUCTION

Traumatic brain injury (TBI) can cause chronic issues such as mood changes, psychosis, and behavioral impairments, which can be disabling.[1] Psychotic disorder due to traumatic brain injury (PDTBI) is a condition where a person experiences hallucinations or delusions after a head injury. Doctors diagnose PDTBI when clear evidence links the psychosis to a brain injury, not another mental illness. Diagnosis is challenging, as symptoms can appear right away or years later, even after mild injuries. Many patients also have seizures or abnormal brain activity after TBI, making it difficult to distinguish whether the psychosis is due to the injury or seizures.[2,3] Some researchers suggest that seizures may facilitate psychosis in TBI patients, many a time blurring the boundary between seizure and psychosis.[4] This report discusses cases of visual hallucinations following TBI, where the hallucinations were found to be directly associated with seizures, rather than being a manifestation of posttraumatic psychosis as might have been initially assumed.

CASE REPORT

A 72-year-old male had a fall on August 15, 2022, with 10-min loss of consciousness. Computed tomography (brain) showed thick subdural hemorrhage in the right tentorium, left basifrontal, bilateral frontal lobes, and subarachnoid hemorrhage in the right occipital and left basifrontal sulci. The patient's wife noted increased irritability, talkativeness, and poor sleep since the incident. He reported seeing people others could not (his cardiologist) and was seen talking to walls, seeing green/red flashes, which were well-formed and mostly in the left side of his vision. Speech was rapid and irrelevant for 3 days before admission. Laboratories showed high HbA1c (10), so insulin was started.

Neurological examination was unremarkable. Magnetic resonance imaging of the brain showed T1 and T2 bright hematoma in the left-basifrontal region with diffusion restriction [Figure 1a], extra-axial bleed along the right tentorial leaflet (6 mm), and hemorrhage at the base of the right medial temporal lobe [Figure 1b]. He was referred to psychiatry for the above symptoms. The patient had no family or past psychiatric history. He had a 10-year history of alcohol dependence, with the last use on July 15, 2022. On mental status examination, he had normal psychomotor activity but had increased talk and euphoria. He did not have any delusions. He was noted to have episodic visual hallucinations. He was conscious, well-oriented,

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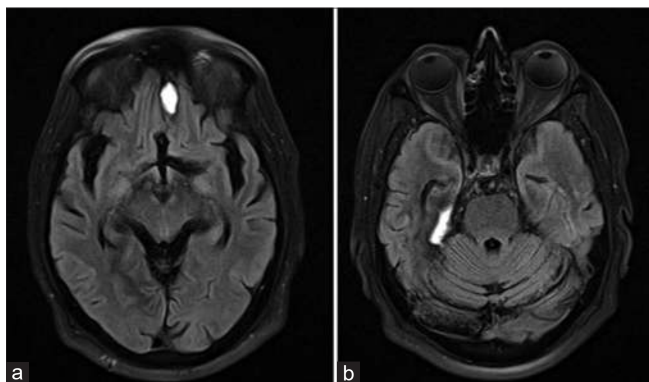

Figure 1: (a) Magnetic resonance imaging (MRI) showing a bright hematoma in the left basifrontal region with diffusion restriction. Note. Hematoma appears bright on sequences in the left basifrontal area. (b) MRI showing extra-axial bleed along the right tentorial leaflet and hemorrhage at the base of the right medial temporal lobe. Note. Approximately 6 mm bleed near the right tentorial leaflet with hemorrhage at the medial temporal base

and had normal memory. He was prescribed risperidone 2 mg for his symptoms, as it was considered a behavioral sequela of TBI. However, since his consciousness and orientation were intact, and his visual hallucinations were only episodic, further examination was warranted to rule out an organic cause for his visual hallucinations. Therefore, a prolonged 3-h video electroencephalogram (vEEG) was done during which he had 12 habitual electroclinical events. These were characterized by well-formed visual hallucinations (seeing a person and calling out his name), but he was conscious throughout. The electroencephalogram (EEG) correlate of these events consisted of the rhythmic buildup of 13–14 Hz activity over the right occipital region evolving into a theta rhythm spreading from the right occipital to a right temporal chain of electrodes [Figure 2a and b]. Hence, these were right occipital seizures manifesting as well-formed visual hallucinations. Given the above, he was given antiseizure medications (ASM). Repeat EEG was done, and it revealed no electroclinical events. A diagnosis of focal seizures without impaired awareness was made. He was continued on ASM. His behavioral issues were controlled with risperidone 2 mg, and visual hallucinations resolved on ASM. He was discharged after 4 days. At 15-day follow-up, hallucinations had not recurred, but euphoria, increased talk, and reduced sleep persisted. Risperidone was increased to 4 mg, then gradually tapered and stopped as behavioral issues resolved. He was continued on two ASMs without residual symptoms. No side effects were noted.

DISCUSSION

This case serves as a prime example of the diagnostic challenge in distinguishing between psychosis and seizure-related visual hallucinations in TBI patients. The pathophysiology of acute symptomatic seizures in SDH, as in this case, is directly related to irritation by blood and its products on the cortical surface. In particular, the decomposition of hemoglobin on the cortical surface is highly epileptogenic.[5] Epileptic hallucinations, illusions, and delusions offer valuable insights into how different brain regions function and perceive. Several reports have described these intriguing seizure symptoms and their phenomenology.[6] These symptoms, known as ictal hallucinations, illusions, or delusions, happen because of abnormal electrical activity in specific brain parts and are experienced only by the person having the seizure. There have been multiple case reports documenting the psychiatric sequelae of TBI. These reports highlight a range of conditions, including neurotic, psychotic, cognitive, and other associated disorders.[7] There have also been multiple reports establishing a temporal correlation of seizures with TBI.[8] A case has also described complex visual hallucinations as the sole manifestation of symptomatic temporo-occipital lobe epilepsy resulting from an old intracerebral hemorrhage.[9] However, to the best of our knowledge, there are no reports of a patient experiencing both neurological (seizures) and psychiatric (psychosis) sequelae following TBI. Therefore, a consensus statement has even recommended continuous EEG monitoring for patients with various cerebral injuries, including moderate-to-severe TBI, when there is clinical suspicion of seizures. This suspicion may be indicated by paroxysmal events of uncertain nature, altered or fluctuating mental state, or situations where anesthesia and paralysis may conceal seizures in a high-risk clinical context.[10] In this case, the diagnosis was clinched by the simultaneous recording of the clinical semiology on video and the EEG, wherein a temporal association between the clinical semiology and the electrographic event could be demonstrated. Therefore, we also recommend that in situations where the diagnosis is challenging, a comprehensive assessment, including vEEG and imaging, should be conducted to aid in accurate diagnosis. This case also emphasizes the importance of acknowledging that visual hallucinations in the context of TBI may be seizure-related rather than psychotic, significantly influencing treatment decisions. In such cases, antiseizure medications (ASMs) are the treatment of choice for seizures manifesting as visual hallucinations, while antipsychotics are used solely for managing behavioural symptoms. This case underscores the need for an integrated approach, combining neurological and psychiatric perspectives to avoid misdiagnosis. It enriches the literature, helping clinicians better differentiate and treat similar symptoms.

CONCLUSION

Complex visual hallucinations may be attributed to seizures rather than psychosis following a TBI.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

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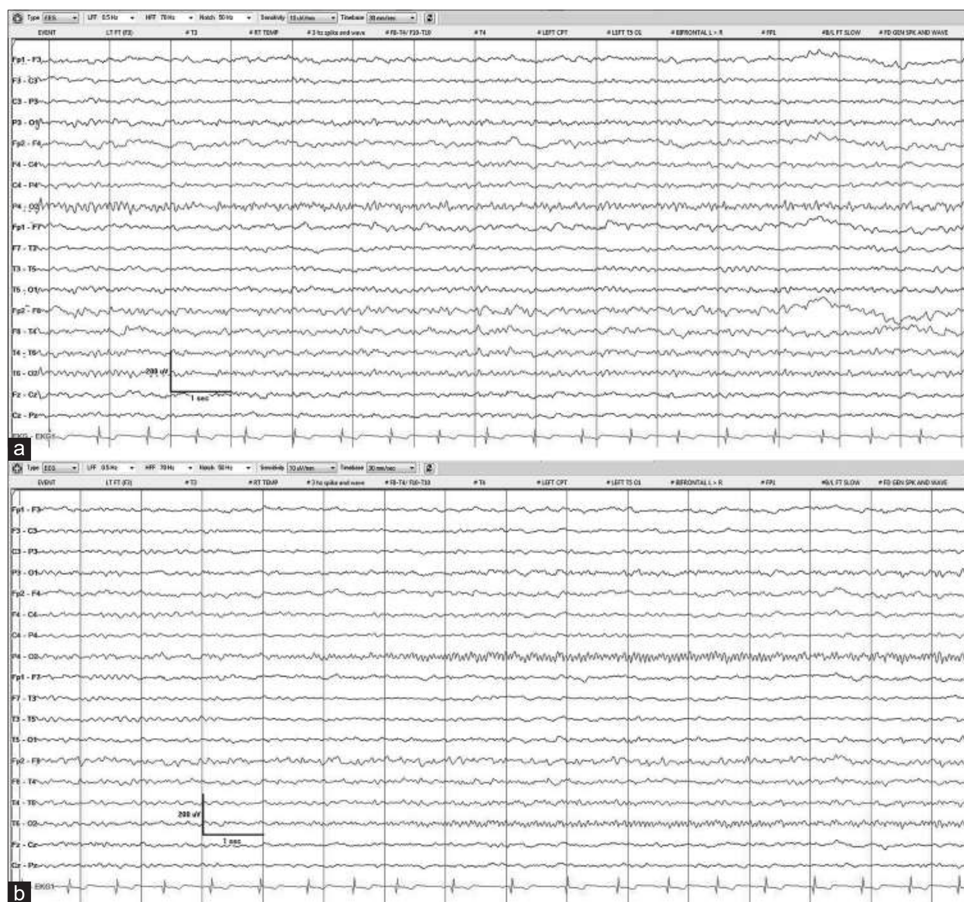

Figure 2: (a and b) Electroencephalogram (EEG) showing rhythmic 13–14 Hz activity in the right occipital region evolving into theta rhythm spreading to the right temporal electrodes. Note. EEG shows evolving rhythmic patterns in right occipital–temporal regions

We would also like to thank the patient and the family who gave consent to publish this case for the advancement in the field of medicine, which in turn will help to alleviate the suffering of the mankind.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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