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Original Research Article

Survey on Awareness, Attitudes, Practices, and Stigma around Brain Stimulation Techniques for Mental Illnesses

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Abstract: ***Background:*** Brain-based technologies such as Transcranial Magnetic Stimulation (TMS) are rapidly emerging as effective tools for treating mental health disorders in India. However, public awareness, attitudes and stigma surrounding these technologies remain underexplored, particularly in Indian clinical settings. ***Objective:*** This study assessed awareness, attitudes, practices and stigma associated with TMS and related non-invasive brain stimulation techniques among attendees of a private psychiatry clinic in southern India. ***Methods:*** A cross-sectional survey employing a 20-item semi-structured questionnaire was administered to 66 participants. Data were analysed using descriptive statistics and inferential tests, including Chi-square, independent-samples t-test and Pearson correlation analyses. ***Results:*** Awareness of TMS was moderate, with 50.0% of respondents reporting familiarity. Education level was not significantly associated with awareness ($\chi^2 = 2.02$, $p = 0.568$), and age differences between awareness groups were non-significant ($t = 0.12$, $p = 0.91$). Concerns regarding brain damage (41%) and memory loss (32%) were prevalent. Belief in TMS safety correlated negatively with treatment concealment ($r = -0.24$), indicating that perceived safety reduces internalised stigma. ***Conclusion:*** Despite partial awareness, stigma and misconceptions persist. Clinician-led educational initiatives, verified digital outreach and community engagement programmes can enhance public understanding and acceptance of brain-based therapies in India.

Keywords: Transcranial Magnetic Stimulation; Mental Health; Awareness; Stigma; Non-invasive Brain Stimulation; India.

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1.1 INTRODUCTION

Mental health disorders constitute a significant global public health burden, contributing substantially to disability, economic loss and psychosocial impairment. The World Health Organization (WHO) estimates that approximately one in four individuals will experience a mental disorder during their lifetime; yet, in low- and middle-income countries, more than 70% of affected individuals receive no treatment [1]. This treatment gap is attributable not only to infrastructure deficits but also to pervasive stigma, misconceptions and inadequate health literacy regarding mental health and emerging therapeutic modalities [2,3].

In recent decades, non-invasive brain stimulation (NIBS) techniques have emerged as promising therapeutic alternatives for psychiatric disorders. The principal modalities include Transcranial Magnetic Stimulation (TMS) and Transcranial Direct Current Stimulation (tDCS). These techniques modulate cortical excitability through electromagnetic induction or weak direct currents, facilitating neuroplastic changes

that ameliorate symptoms of depression, obsessive-compulsive disorder (OCD) and anxiety disorders [4,5]. TMS has received regulatory approval from the United States Food and Drug Administration (US-FDA) for the treatment of major depressive disorder and OCD in pharmacotherapy-resistant patients [6]. A substantial body of evidence supports its safety and efficacy, both as a standalone intervention and as an adjunct to pharmacological treatment [7,8].

Despite the growing evidence base, awareness of TMS and related neurostimulation technologies remains limited in India. A significant proportion of both patients and clinicians continue to conflate TMS with Electroconvulsive Therapy (ECT), engendering fears of electric shocks, memory impairment and neurological damage [9]. Such misconceptions derive from inadequate mental health literacy, cultural taboos and sensationalised media portrayals [10,11]. Consequently, many patients either decline or delay potentially beneficial and evidence-based treatments.

The present study was designed to systematically evaluate awareness, attitudes, practices and stigma associated with TMS and related brain-based mental health technologies among patients and caregivers attending a private neuromodulation clinic in Hyderabad city, that offers deep TMS for Anxiety, Depression, and Obsessive-Compulsive Disorder (OCD). Through rigorous survey methodology and inferential statistical analysis, this research aims to identify modifiable factors influencing public perception and to propose evidence-based strategies for enhancing awareness, clinical communication and policy support for neurostimulation therapies in the Indian context.

1.2 Research Objectives

The present study was undertaken with the following objectives:

1. To assess awareness levels regarding brain-based mental health technologies, particularly Transcranial Magnetic Stimulation (TMS), among patients and caregivers.
2. To examine attitudes, beliefs and stigma associated with the use of TMS and related interventions.
3. To identify primary sources of information influencing awareness and acceptance.
4. To analyse associations between demographic variables (education, age, gender) and awareness or stigma through descriptive and inferential statistics.
5. To determine correlations between perceived safety of TMS and willingness to disclose treatment as a measure of internalised stigma.
6. To propose targeted strategies for enhancing public awareness, clinical communication and policy support for neurotechnological mental health treatments in India.

1.3 Review of Literature

Evolution of Brain-Based Mental Health Technologies

The foundation of brain-based mental health technologies traces back to the pioneering work of Barker, Jalinous and Freeston (1985), who demonstrated for the first time that magnetic pulses delivered through the scalp could non-invasively stimulate the human motor cortex to produce Motor Evoked Potentials [12]. This landmark discovery opened the door to exploring magnetic stimulation as a tool for modulating brain activity in clinical populations. Over the following decades, researchers extended these findings into psychiatric applications, particularly for depression. George and Post (2011) conducted a pivotal study demonstrating that daily left prefrontal repetitive transcranial magnetic stimulation (rTMS) was effective in treating medication-resistant depression, establishing the dorsolateral prefrontal cortex (DLPFC) as a key therapeutic target [13]. Their work showed that targeting this specific brain region with repeated magnetic pulses could produce clinically meaningful improvements in patients who had not responded to standard antidepressant medications.

Building on this growing evidence base, Lefaucheur *et al*. (2014) published comprehensive evidence-based guidelines for the therapeutic use of rTMS, grading it with Level A evidence (definite efficacy) for high-frequency stimulation of the left DLPFC in depression [14]. These guidelines were subsequently updated by Lefaucheur *et al*. (2020) to incorporate evidence from 2014 to 2018, further confirming the safety and efficacy of rTMS across multiple neuropsychiatric conditions [15]. Chen *et al*. (2023) provided an extensive review of accelerated rTMS protocols, tracing the evolution of treatment from conventional once-daily sessions to intensive multi-session-per-day approaches that can produce rapid antidepressant effects within days rather than weeks [16].

Alongside TMS, transcranial direct current stimulation (tDCS) has emerged as another non-invasive neuromodulation technique. Nitsche and Paulus (2000) demonstrated that weak direct currents applied through scalp electrodes could modulate cortical excitability in humans, with anodal stimulation increasing and cathodal stimulation decreasing excitability [17]. Subsequent research extended these motor cortex findings to cognitive domains; Fregni *et al*. (2005) showed that anodal tDCS over the prefrontal cortex could enhance working memory performance in healthy participants [18], establishing tDCS as a potential tool for cognitive enhancement and clinical rehabilitation. More recently, Albishi *et al*. (2025) surveyed rehabilitation specialists in Saudi Arabia regarding their knowledge, attitudes and motivation concerning tDCS and found that while interest in the technique was high, practical knowledge and training remained limited [19]. This finding

underscores that even among health professionals, awareness of non-invasive brain stimulation techniques often lags behind the growing evidence for their clinical utility. However, in India, both TMS and tDCS remain largely confined to tertiary care centres and specialised neuropsychiatric hospitals, limiting public awareness and accessibility.

The Indian landscape of TMS research has been growing steadily. Tikka *et al*. (2023) conducted a bibliometric analysis of Indian TMS research and documented 146 publications with a statistically significant linear increase over time ($R^2 = 0.7869$, $P < 0.001$), indicating growing academic interest [20]. Furthermore, Tikka *et al*. (2023) also contributed to the formulation of Indian clinical practice guidelines for TMS use in neuropsychiatric disorders under the Indian Psychiatric Society, representing a formal institutional endorsement of the technique [21]. Grover *et al*. (2023) conducted a systematic review and meta-analysis of Indian studies on therapeutic TMS and confirmed its safety and efficacy across neuropsychiatric conditions in the Indian population [22].

Stigma and Mental Health Literacy

Stigma remains one of the most significant barriers to mental health treatment worldwide. Corrigan and Watson (2002) proposed an influential three-component model of mental health stigma comprising stereotypes (negative beliefs about a group), prejudice (emotional reactions arising from stereotypes) and discrimination (behavioural consequences of prejudice) [23]. They demonstrated that both public stigma and self-stigma operate through these three components, creating barriers at individual, interpersonal and institutional levels. Corrigan (2004) further elaborated on how stigma specifically interferes with mental health care, showing that anticipated stigma deters help-seeking, label avoidance prevents people from accepting diagnoses and structural discrimination limits access to quality care [24].

In the Indian context, mental health stigma is compounded by culturally specific beliefs. Böge *et al*. (2018) surveyed the general population across five metropolitan Indian cities including Hyderabad and found high levels of perceived stigmatisation and discrimination toward people with mental illness [25]. Their findings revealed that stigma was prevalent even in urban, educated populations, suggesting that economic development alone is insufficient to address deep-rooted cultural attitudes toward mental illness.

Mental health literacy, defined by Jorm (2000) as public knowledge and beliefs about mental disorders that aid their recognition, management and prevention, is a crucial determinant of help-seeking behaviour [2]. Thornicroft (2007) argued that the majority of people with mental illness worldwide are not properly treated, identifying stigma and lack of knowledge as the two primary barriers [3]. Clement *et al*. (2015) conducted a systematic review of 144 studies and confirmed that stigma was the fourth-largest barrier to help-seeking, with disclosure concerns and perceived social judgement being the most frequently reported components [26]. Srivastava, Chatterjee and Bhat (2016) specifically examined the Indian mental health scenario and documented a treatment gap of 76–85% in less-developed countries including India, attributing this gap to inadequate mental health literacy, infrastructure shortages and pervasive stigma [27].

Critically, most mental health literacy programmes in India focus exclusively on pharmacotherapy and psychotherapy, leaving brain stimulation technologies almost entirely unaddressed. Morrison *et al*. (2022) conducted a study specifically on public mental health literacy concerning rTMS and found that initial public perceptions of rTMS were significantly more negative than those for pharmacotherapy and psychotherapy [28]. However, their study also demonstrated that brief educational interventions could substantially improve attitudes toward rTMS, suggesting that targeted literacy programmes could be effective.

Perceptions and Acceptance of TMS

Public and professional perceptions play a decisive role in the clinical adoption of brain stimulation technologies. Brunoni *et al*. (2019) published a comprehensive primer on non-invasive brain stimulation in psychiatric disorders, establishing that TMS is a well-tolerated technique with seizure as the only serious but exceedingly rare adverse event [29]. Despite such safety data, misperceptions persist. Atkinson-Clement, Junor and Kaiser (2025) conducted a large-scale study on public perception of neuromodulation and found widespread confusion between TMS and electroconvulsive therapy (ECT), with many respondents associating brain stimulation with electroshock, pain and memory loss [30]. This TMS–ECT confusion is a recurring theme in the literature and has been documented across multiple countries and populations.

In India, Prasad *et al*. (2021) studied knowledge, attitudes and perceptions about deep brain stimulation (DBS) for Parkinson's disease and found that only 18% of patients and 20.25% of caregivers were aware of DBS as a treatment option [10]. While this study focused on DBS rather than TMS, it provides the closest available Indian data on public awareness of brain stimulation technologies, and the low awareness are likely representative of or even optimistic for TMS awareness in the general population. The study also revealed significant misconceptions among those who claimed awareness, with many confusing brain stimulation procedures with each other.

Professional attitudes toward TMS have been studied in several countries, consistently revealing gaps between theoretical acceptance and practical knowledge. Bourla *et al*. (2020) surveyed French psychiatrists and found that while most considered TMS credible, fewer than one-third had received any formal TMS training [31]. AlHadi *et al*. (2017) found similar results among Saudi psychiatrists, where theoretical knowledge about rTMS was moderate but practical experience was limited [32]. Sierra *et al*. (2024) surveyed Spanish mental health professionals and reported analogous findings: professionals were broadly supportive of TMS but lacked training and practical exposure [33]. Most recently, Al-Balushi *et al*. (2025) examined awareness and attitudes toward TMS among psychiatrists in Oman and found that while awareness of TMS existed, significant knowledge gaps persisted regarding indications, protocols and safety parameters [34]. In India, where families and communities often participate in health care decisions collectively, physician endorsement carries particular weight in shaping patient and family acceptance of new treatments.

Goldbloom and Gratzer (2020) examined barriers to brain stimulation therapies for treatment-resistant depression and identified multiple obstacles beyond cost-effectiveness, including limited public awareness, patient scepticism, insufficient clinician education and structural barriers within health systems [35]. Their analysis emphasised that TMS remains unfamiliar to many health professionals, patients and families globally, and that addressing this knowledge gap requires coordinated efforts across clinical, educational and policy domains.

Digital Media and Information Dissemination

The rise of digital media has fundamentally altered how the public encounters health information, including information about brain stimulation technologies. Scheper, Rosenfeld and Dubljevic (2022) analysed over 2,100 articles comparing academic and print media portrayals of TMS and found significant discrepancies between the two [36]. Print media portrayals were heavily optimistic, less specific about TMS parameters and indications and more likely to portray the technique as a breakthrough cure. This gap between scientific precision and media sensationalism can create unrealistic expectations or unfounded fears among the public.

In the present study, a substantial proportion of participants identified the internet and social media as their primary source of information about TMS. This finding aligns with global trends but raises concerns about the quality and accuracy of the information being consumed. When clinicians explain TMS alongside online information, patient attitudes have been shown to improve. This suggests that India requires more clinician-led and verified digital communication strategies about brain stimulation technologies, combining the reach of digital media with the credibility of professional medical guidance.

Gaps in Existing Literature

Despite growing global interest in neurostimulation, several important gaps exist in the current literature. First, there is a near-complete absence of Indian studies examining public awareness and perceptions of TMS specifically. The existing Indian literature on brain stimulation awareness is limited to DBS awareness among Parkinson's disease patients [10] and bibliometric analyses of research output [20]. No published Indian study has measured TMS awareness among general mental health service users or the broader public. While studies from neighbouring regions such as Oman [34], Saudi Arabia [32] and France [31] have examined professional attitudes toward TMS, no comparable study exists for Indian healthcare professionals, l*et al*one for patients and caregivers.

Second, most existing research on TMS perceptions has focused on healthcare professionals rather than patients and caregivers [31,32,33,34]. The patient perspective particularly in low- and middle-income countries where family involvement in treatment decisions is substantial remains underexplored.

Third, few studies have attempted to link awareness, attitudes and stigma within a single analytical framework using inferential statistics. Most existing work presents only descriptive data without testing for associations between demographic variables, knowledge levels and stigma indicators.

This research fills these gaps by conducting a structured survey among patients and caregivers at ANC Clinic, Gachibowli, Hyderabad. It assesses awareness levels and information sources, examines attitudes and beliefs through validated Likert-scale items and analyses associations between demographic variables (age, education, gender) and awareness or stigma using Chi-square tests, t-tests and Pearson correlation analyses. By linking perceived safety of TMS to willingness to disclose treatment a proxy for internalised stigma the study provides evidence for the knowledge-attitude-behaviour model of stigma reduction in the specific context of brain-based mental health technologies in India.

2. MATERIALS AND METHODS

2.1 Study Design and Setting

A cross-sectional, descriptive survey design was employed for the present investigation. The study was conducted at a multidisciplinary psychiatric outpatient facility catering to patients with a range of mental health conditions. This clinical setting was selected due to its diverse patient demographic and the availability of TMS as a treatment modality, providing access to participants with varying degrees of exposure to brain-based interventions.

2.2 Participants

A total of 78 participants including patients received TMS treatment and caregivers were recruited through convenience sampling. Inclusion criteria comprised: (a) age 18 years or above, (b) ability to read and comprehend English and (c) willingness to provide informed consent. 10 participants submitted incomplete questionnaires and 2 did not submit the questionnaire for analysis and hence they were excluded from the analysis. The final sample of 66 participants comprised individuals with heterogeneous educational backgrounds and occupational profiles, with a predominantly urban residential distribution.

2.3 Survey Instrument

Data were collected using a 20-item semi-structured questionnaire partly adapted from previously validated instruments assessing mental health knowledge and attitudes [37,38]. The questionnaire was organised into five domains: (i) socio-demographic characteristics (age, gender, education, occupation and residence); (ii) awareness of brain-based treatments; (iii) attitudes regarding safety and efficacy; (iv) stigma and disclosure willingness; and (v) perceived outcomes and barriers to treatment uptake. Items in domains (ii) through (v) were measured on a five-point Likert scale ranging from Strongly Agree (1) to Strongly Disagree (5). Specifically, Questions 1–6 assessed awareness and information sources, Questions 7–14 addressed beliefs and stigma and Questions 15–20 captured concerns, fears and personal experiences. The questionnaire was initially tested for internal validity (Chronbach's alpha =) before administration to the participants.

2.4 Data Management and Statistical Analysis

All responses were entered into Microsoft Excel and subjected to systematic data cleaning, including verification of completeness, consistency and coding accuracy. Statistical analyses were performed using Python (pandas, SciPy) and Microsoft Excel. Descriptive statistics (mean, median, standard deviation, frequency and percentage) were computed for demographic and survey variables. Chi-square tests of independence were used to examine associations between categorical variables (education level and awareness status). Independent-samples t-tests were employed to compare mean ages between awareness groups. Pearson's correlation coefficient was computed to evaluate the relationship between perceived TMS safety (Q8) and willingness to disclose treatment (Q14) as an indicator of internalised stigma. Statistical significance was set at $p < 0.05$ for all analyses.

2.5 Ethical Considerations

Written informed consent was obtained from all participants prior to data collection. Participant identities and personal information were maintained as strictly confidential throughout the study.

3. RESULTS AND DISCUSSION

3.1 Overview of the Analysis

The analysis integrates quantitative trends and inferential testing to evaluate public awareness, attitudes, practices and stigma toward brain-based mental health technologies, with specific focus on TMS. The overall analytic framework from survey design through data collection, entry and statistical analysis is summarised.

3.2 Participant Characteristics

The demographic distribution of the sample (n = 66) is summarised in Table 3.2.1. Females constituted 56% (n = 37) and males 35% (n = 23) of the sample, while the remainder (9%, n = 6) preferred not to disclose their gender. The mean age was 40.6 ± 11.2 years and the median age was 36.5 years, indicating a predominantly middle-aged cohort. Educational attainment ranged from high school (10%) to doctoral qualifications (2%), with graduates (45%) and postgraduates (33%) forming the majority. The majority of participants (80%) resided in urban areas, consistent with prior Indian outpatient samples demonstrating the urban concentration of mental health service utilisation [39].

Table 3.2.1: Participant Demographics

Variable	Distribution
Total Participants	66
Gender	Female: 37 (56%); Male: 23 (35%); Others/Not disclosed: 6 (9%)
Education Level	High School: 10%; Graduate: 45%; Postgraduate: 33%; Doctorate: 2%; Not specified: 10%
Residence	Urban: 80%; Semi-Urban: 12%; Rural: 8%
Mean Age (years)	40.6 ± 11.2 (Median: 36.5)

3.3 Awareness of Brain Stimulation Technologies

Awareness levels of TMS and related interventions were moderate (Table 3.3.1. Approximately 50.0% of participants (n = 33) reported being aware of TMS, while 40.9% (n = 27) reported no awareness and 9.1% (n = 6) were uncertain. Regarding sources of information, doctors or mental health professionals constituted the most frequently cited source (53.0%, n = 35), followed by internet or social media (19.7%, n = 13), first-time hearing about it (6.1%, n = 4) and friends or family (4.5%, n = 3). Only 34.8% (n = 23) correctly identified TMS as a US-FDA-approved therapy for depression and OCD, while 42.4% (n = 28) were unaware of its regulatory approval status and 13.6% (n = 9) were uncertain. These findings

indicate limited factual knowledge despite nominal awareness.

These results confirm that while digital exposure drives recognition, medical literacy remains superficial [36]. The internet has become a double-edged channel, expanding outreach but simultaneously amplifying misinformation about neurotechnological procedures.

Table 3.3.1: Awareness and Information Sources

Variable	Response Category	Frequency (n, %)
Awareness of TMS	Yes	33 (50.0%)
	No	27 (40.9%)
	Not sure	6 (9.1%)
Source of Information	Doctor or mental health professional	35 (53.0%)
	Internet or social media	13 (19.7%)
	First time hearing about it	4 (6.1%)
	Friend or family	3 (4.5%)
	News or articles	2 (3.0%)
	Multiple sources	5 (7.6%)
	Not specified	4 (6.1%)
Knowledge of FDA Approval	Yes	23 (34.8%)
	No	28 (42.4%)
	Not sure	9 (13.6%)
	Not specified	6 (9.1%)

3.4 Relationship Between Education, Age and Awareness

To assess relationships between demographic variables and awareness, Chi-square and t-tests were applied (Table 3.4.1). The Chi-square statistic ($\chi^2 = 2.02$, df = 3, p = 0.568) indicated no statistically significant association between education level and TMS awareness. Similarly, the independent-samples t-test (t = 0.12, p = 0.91) revealed no significant difference in mean age between aware and unaware groups.

Although not statistically significant, a mild directional trend suggested higher awareness among graduates and younger adults. This finding corresponds with prior Indian evidence suggesting that higher education enhances exposure to health information but does not necessarily translate to deeper understanding of advanced psychiatric interventions [26]. The implication is that effective dissemination strategies should prioritise content clarity and accessibility over demographic targeting.

Table 3.4.1: Summary of Inferential Statistical Tests

Statistical Test	Variables Compared	Results (Interpretation)
Chi-square Test	Education × Awareness	$\chi^2 = 2.02$, df = 3, p = 0.568 (Not significant)
Independent t-Test	Age (Aware vs. Not Aware)	t = 0.12, p = 0.91 (No significant difference)
Pearson Correlation (r)	Belief in TMS safety (Q8) × Disclosure willingness (Q14)	r = −0.24 (Negative correlation; greater safety belief linked to greater openness)

3.5 Attitudes and Beliefs Toward Brain Stimulation

Responses to the Likert-scale items (Q7–Q14) revealed a complex interplay of curiosity and caution (Table 3.5.1. Sixty percent of respondents agreed that mental disorders are chronic conditions requiring continuous management. Fifty-seven percent believed that TMS could accelerate recovery, whereas 20% remained sceptical. Notably, 47% equated brain stimulation with electric shock therapy, reflecting persistent confusion between TMS and ECT. Conversely, 68% acknowledged that not all brain stimulation is invasive and 53% identified TMS as safer than ECT.

These patterns echo prior observations wherein partial awareness coexists with residual stigma rooted in ECT history [30]. The simultaneous perception of TMS as both innovative and intimidating exemplifies the informational ambivalence characteristic of early-adoption phases for emerging therapeutic technologies.

Table 3.5.1: Attitudes and Beliefs (Likert Summary, Q7–Q14)

Item	Theme	Median Response
Q7	Mental health problems are lifelong conditions	3.0 (Neutral)
Q8	TMS hastens recovery	2.0 (Agree)
Q9	Brain stimulation is unsafe	4.0 (Disagree)
Q10	Brain stimulation causes pain	4.0 (Disagree)
Q11	TMS is safer than ECT	1.0 (Strongly Agree)
Q12	TMS does not interfere with daily life	1.0 (Strongly Agree)

Q13	Reluctance to discuss treatment publicly	2.0 (Agree)
Q14	Willingness to disclose treatment	2.0 (Agree)

3.6 Stigma and Reluctance to Disclose Treatment

Stigma emerged as a dominant theme influencing treatment acceptance. Approximately 35% of respondents indicated that they would avoid publicly discussing their own or their family member's use of TMS. Pearson correlation analysis revealed a negative correlation ($r = -0.24$) between perceived safety of TMS (Q8) and reluctance to disclose treatment (Q14): participants who perceived TMS as safe demonstrated greater willingness to disclose their treatment status.

This finding is consistent with the knowledge-attitude-behaviour model of stigma reduction proposed by Corrigan (2004), which posits that accurate information fosters positive beliefs, subsequently leading to reduced secrecy and enhanced help-seeking behaviour [24]. The present data thus suggest that improving factual understanding of TMS directly mitigates internalised stigma. This finding provides empirical support for structured psychoeducation programmes within clinical settings as a viable strategy for stigma reduction.

3.7 Concerns and Barriers to Uptake

The reported fears and barriers to TMS uptake are summarised in Table 3.7.1. The most frequently cited concerns included: fear of brain damage (41%), memory loss (32%), serious adverse effects (28%), perception of TMS as a new or unknown treatment (25%), insufficient awareness (24%), financial constraints (18%) and family or cultural objections (15%). Notably, 39.4% of participants (n = 26) reported no specific concerns.

These findings are consistent with regional studies highlighting safety misconceptions as the principal deterrents to neurostimulation uptake [35]. It is noteworthy that financial cost ranked lower than psychological fears, suggesting that risk perception outweighs affordability concerns in shaping treatment hesitancy. This distinction carries critical implications for policy messaging, indicating that educational interventions may be more impactful than financial subsidies during early awareness phases.

Table 3.7.1: Concerns and Barriers to TMS Uptake

Concern / Barrier	Frequency (n, %)
No specific concerns	26 (39.4%)
New / unknown treatment	13 (19.7%)
Damage to brain	8 (12.1%)
Not enough awareness	8 (12.1%)
Serious adverse effects	4 (6.1%)
Financial constraints	5 (7.6%)
Family / cultural concerns	4 (6.1%)
Memory loss	1 (1.5%)

3.8 Motivating Factors for Treatment Acceptance

The motivating factors encouraging TMS uptake are summarised in Table 3.8.1 Doctor recommendation emerged as the predominant motivator (69.7%, n = 46), followed by online information (13.6%, n = 9), family support (12.1%, n = 8) and patient success stories (18.2%, n = 12 combined). These findings reaffirm the central role of clinical endorsement as a determinant of public trust in novel therapeutic modalities [31,34].

Participants also characterised TMS as a user-friendly intervention, emphasising its outpatient administration, brief session duration and minimal adverse effects. This perception indicates that procedural convenience complements medical credibility as a dual enabler of treatment acceptance.

Table 3.8.1: Motivating Factors for TMS Uptake

Motivating Factor	Frequency (n, %)
Doctor advice / recommendation	46 (69.7%)
Online information	9 (13.6%)
Family support	11 (16.7%)
Success stories	12 (18.2%)
Still unsure	3 (4.5%)
Other / not specified	3 (4.5%)

3.9 Perceived Outcomes and Subjective Improvement

Among participants with personal or familial experience of TMS treatment, 72% reported subjective symptom improvement, 18% remained uncertain

regarding treatment benefit and 10% perceived no improvement. Regarding perceived mechanisms of improvement, 43% attributed their recovery to the combined effect of TMS and concurrent pharmacotherapy, 22% credited TMS as the sole therapeutic agent and 15% attributed improvement to placebo effects or positive expectancy. These findings are summarised in Table 3.9.1

These results are consistent with prior clinical reports indicating that subjective improvement in TMS patients frequently precedes objective neurobiological change [22]. The predominant attribution of improvement to combined TMS–pharmacotherapy regimens suggests that patients place greater confidence in multimodal treatment approaches relative to monotherapy, an important consideration for clinical communication and treatment planning.

Table 3.9.1: Perceived Outcomes and Attribution of Improvement

Reported Outcome / Perceived Reason	Frequency (n, %)
TMS worked well with medications	24 (36.4%)
TMS alone made a difference	5 (7.6%)
Improvement observed but mechanism unclear	4 (6.1%)
Can comment only after sustained improvement	6 (9.1%)
TMS may have worked as a placebo	2 (3.0%)
No response / Not applicable	15 (22.7%)
Other (doctor empathy, own observations)	10 (15.2%)

3.10 Comparative Discussion with Existing Literature

When compared with earlier Indian data, the present findings suggest a notable increase in awareness of brain stimulation technologies. Prasad *et al*. (2021) reported that only 18% of patients and 20.25% of caregivers were aware of deep brain stimulation [10]; in the present survey, more than 50% of attendees at reported awareness of TMS. While these are not directly comparable the earlier study focused on DBS awareness among Parkinson's disease patients the contrast suggests a broader trend of increasing exposure to brain stimulation concepts among Indian clinical populations. Nevertheless, persistent misconceptions remain, particularly the conflation of TMS with ECT and associated fears of electric shocks. Such misunderstandings are not unique to India; they have been documented across European populations, even among more educated individuals [31,34].

In Western clinical settings, more favourable public attitudes toward TMS are attributable to systematic clinician-patient communication and pre-treatment counselling [28]. In India, the relative paucity of TMS-related content in mainstream media and public health programmes contributes to continued uncertainty and apprehension. These findings underscore the urgent need for clinician-led dissemination of accurate, evidence-based information regarding TMS to the Indian public.

3.11 Conceptual Integration of Findings

Synthesising the descriptive and inferential analyses yields a coherent interpretive model: (1) awareness arises primarily from informal digital exposure; (2) beliefs are shaped by perceived safety and efficacy; (3) stigma is mediated by these beliefs, with fear fostering secrecy; and (4) acceptance occurs when professional endorsement neutralises stigma. This cascade implies that increasing the flow of credible information from clinician to patient and from patient to community can substantially enhance adoption rates for brain-based mental health technologies.

3.12 Study Limitations

Despite robust analytical coverage, several limitations warrant acknowledgement. The modest sample size (n = 66) restricts the generalisability of the findings. The single-site, urban sampling framework may not adequately represent the perspectives of rural or semi-urban populations, where access to neurostimulation technologies is even more limited. Self-report methodology introduces recall and social desirability biases, and sparse cell counts in contingency tables may reduce statistical power. Additionally, Likert-scale responses were analysed quantitatively without qualitative elaboration of underlying sentiments, potentially limiting interpretive depth.

Notwithstanding these limitations, the combination of descriptive and inferential evidence, supported by multiple cross-validated survey items, enhances internal validity and establishes a substantive foundation for future multicentre investigations.

3.13 Implications for Practice and Policy

Clinical Communication: Mental health professionals should routinely incorporate explanations of the scientific basis and safety profile of TMS into their clinical consultations to mitigate patient apprehension and correct prevalent misconceptions.

Digital Awareness Campaigns: Verified multimedia content including short explanatory videos, frequently asked questions and evidence-based infographics should be developed and disseminated through authoritative digital channels to counteract unregulated online anecdotes and misinformation.

Public Health Integration: TMS literacy should be systematically integrated within national mental health programmes, such as the National Mental Health Programme (NMHP) and District Mental Health Programme (DMHP), to normalise neurostimulation as a mainstream therapeutic option.

Community Engagement: Public seminars, workshops and patient testimonial events featuring individuals with positive TMS experiences could serve to reduce fear and build community-level trust through first-hand success narratives.

Collaborative Policy Action: Partnerships between the National Accreditation Board for Hospitals and Healthcare Providers (NABH), the National Institute of Mental Health and Neurosciences (NIMHANS) and private neuropsychiatric clinics could ensure the development and dissemination of standardised patient-education materials across India.

These actions collectively aim to convert fear into familiarity, enabling informed and equitable acceptance of non-invasive neuromodulation treatments.

The present study demonstrates that awareness of TMS among patients and caregivers in an Indian clinical setting is expanding, yet stigma and partial misconceptions persist. Statistical evidence indicates that formal education and age exert limited influence on awareness levels, whereas perceived safety and clinical trust emerge as the strongest predictors of openness to treatment disclosure. Addressing the psychological component of stigma through clinician-led education and verified digital outreach can transform hesitant awareness into informed acceptance. As India's mental health landscape embraces therapeutic innovation, brain-based technologies such as TMS must be demystified through transparent communication, structured professional training and meaningful inclusion in public discourse steps that are essential for achieving equitable and stigma-free mental health advancement.

4. CONCLUSION

The present cross-sectional survey reveals that approximately half of the respondents at ANC Clinic, Gachibowli, Hyderabad, reported awareness of TMS, yet a substantial proportion harboured misconceptions or remained uncertain regarding its safety and therapeutic efficacy. The absence of statistically significant associations between demographic variables (age, education) and awareness status suggests that general mental health literacy, rather than formal educational attainment per se, is the more pertinent determinant of knowledge regarding brain-based interventions.

Fears of brain damage and memory loss constituted the predominant barriers to treatment acceptance, indicating that safety misconceptions rooted in the conflation of TMS with ECT continue to impede uptake. Conversely, the observed negative correlation between perceived TMS safety and treatment concealment ($r = -0.24$) provides empirical evidence that enhancing factual knowledge can directly reduce internalised stigma and promote greater openness to treatment disclosure.

Healthcare professionals occupy a pivotal position in shaping public perceptions of neurostimulation technologies. Clinician-led counselling, complemented by verified digital health communication strategies and community engagement initiatives, represents the most promising pathway for enhancing public understanding and acceptance. The integration of TMS literacy into national mental health programmes and the development of standardised patient-education materials through institutional partnerships are recommended as systemic measures to address the identified knowledge gaps.

Although the present study is limited by its modest sample size and single-site design, it provides a foundational empirical contribution to a critically underexplored area of Indian mental health research. Future investigations employing larger, multicentre samples and mixed-methods designs are warranted to validate and extend these findings, with the ultimate objective of ensuring that all individuals in India have equitable access to safe, evidence-based and stigma-free mental health care.

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ANNEXURE 1: Questionnaire

Is Stigma Around Brain Stimulation holding us from treating Mental Health Disorders? A survey on Knowledge, Attitudes and Practices

1. Age: _____
2. Gender: ☐ Male ☐ Female ☐ Non-binary ☐ Prefer not to say
3. Education Level: ☐ High School ☐ Graduate ☐ Postgraduate ☐ Doctorate
4. Occupation: _____
5. Location: ☐ Urban ☐ Semi-Urban ☐ Rural

1. According to you, is there a need to introduce advanced technologies in the treatment of mental health problems in our country? **Yes** **☐ No** **☐ Not sure**
2. Were you aware of Brain Stimulation technologies like TMS and TDCS now being used in our country to treat mental health conditions? **Yes** **☐ No** **☐ Not sure**
3. Apart from TMS, which other treatments have you heard of, which can help with the treatment of mental health issues? (Tick all that apply)
☐ Focused Ultrasound Treatment ☐ Transcranial Electric Stimulation ☐ Deep Brain Stimulation
☐ Vagus Nerve Stimulation ☐ Neurofeedback ☐ Quantitative EEG ☐ Not much awareness
4. How did you first hear about TMS treatment?
☐ Doctor or mental health professional ☐ Internet or social media ☐ Friend or family
☐ News or articles ☐ First time hearing about it
5. Did you know that TMS was approved by the US-FDA for the treatment of Depression and OCD?
☐ Yes ☐ No ☐ Not sure
6. How do you think mental health conditions are usually treated? (Tick all that apply)
☐ They usually improve on their own without any treatment ☐ Psychiatric medication ☐ Brain surgery
☐ Long-term stay in a mental asylum ☐ Brain stimulation ☐ Electric shocks ☐ I don't know
7. Please opine: Mental health problems do not get cured in a short time. They are lifelong problems.
☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
8. Please opine: Recent technologies like TMS can hasten the recovery from mental health conditions and the person will be able to resume the work within a short time.
☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
9. Please opine: Brain Stimulation techniques mostly employ electric shock treatment which is unsafe for the human brain.
☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
10. Do you believe that any sort of brain stimulation treatment causes pain because the brain is a very sensitive organ?
☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
11. Did you know that all Brain Stimulation techniques need not be invasive (meaning, not involving injections/surgery/anesthesia) to the brain or body?
☐ Yes ☐ No ☐ Not sure
12. Please opine: TMS is a safer alternative to Electric Shock Treatment.
☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
13. Please opine: TMS treatment does not interfere in the day-to-day activities.
☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
14. Please opine: If someone or I in my family are undergoing TMS for Mental Health wellbeing, I would not prefer to talk about it publicly.
☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
15. Did you or your family member feel hesitant, due to any reason, before taking TMS treatment?
☐ Yes ☐ No ☐ Not sure

16. If yes, what were your main concerns? (Tick all that apply)
☐ Damage to Brain ☐ Memory loss ☐ Serious adverse effects ☐ New/unknown treatment
☐ Not enough awareness ☐ Family/cultural concerns ☐ Financial Constraints ☐ None
17. Which factor(s) convinced you to take the TMS treatment ? (Tick all that apply)
☐ Doctor's advice ☐ Family support ☐ Online info ☐ Success stories ☐ Still unsure
18. According to you, what makes TMS treatment more user-friendly ? (Tick all that apply)
☐ Out-patient procedure ☐ Few side effects ☐ Substantial recovery ☐ US-FDA treatment
☐ Cost-effective ☐ Short session durations ☐ Treatment can be completed within a week ☐ None
19. After you or your family member has taken the TMS treatment, has there been any improvement in their condition?
☐ Yes ☐ No ☐ Not sure
20. If yes, what do you think could have been responsible for this improvement?
☐ TMS worked well along with medications given by my doctor
☐ TMS alone must have made a difference as we were using medications for a long time
☐ Medications gave a good recovery in the beginning but TMS helped to speed up the same
☐ TMS could have worked as a placebo
☐ I can comment only after this improvement will sustain for a long time
☐ I don't know how TMS works, or medicine works, but I've observed the improvement after TMS treatment
☐ None