ORIGINAL RESEARCH PAPER

Mental Health Nursing

KEY WORDS: mental illness stigma; anti-stigma intervention; India; systematic review; meta-analysis; contact-based education; community health workers; LMIC; publication bias; PRISMA 2020

# EFFECTIVE WAYS TO REDUCE STIGMA OF MENTAL ILLNESS IN INDIA: A SYSTEMATIC REVIEW AND META-ANALYSIS

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ABSTRACT

**Background:** Social stigma toward mental illness is the foremost barrier to care in India, contributing to a treatment gap of 75–95%. Despite 197 million affected individuals, no comprehensive meta-analysis has synthesized quantitative evidence on stigma-reduction interventions within the Indian sociocultural context.**Objectives:** To systematically identify and meta-analytically synthesize evidence on interventions to reduce mental illness stigma in India; estimate pooled effect sizes (Hedges' g); assess heterogeneity; conduct comprehensive publication bias analysis using five complementary methods; and evaluate evidence quality using GRADE.**Methods:** Systematic search of eight databases (PubMed/MEDLINE, PsycINFO, Cochrane Central, Scopus, CINAHL, Embase, IndMED, Google Scholar) for studies published January 2000–March 2025. PRISMA 2020 guidelines followed. Quality assessment used Cochrane RoB 2.0 and Newcastle-Ottawa Scale. Random-effects meta-analysis applied DerSimonian-Laird estimator. Publication bias assessed through funnel plots, Egger's regression, Begg's rank correlation, trim-and-fill, and p-curve analysis.**Results:** Of 2,026 records identified, 28 studies (k=22 in meta-analysis; N=9,462) met inclusion criteria. Pooled Hedges' g = 0.50 (95% CI: 0.44–0.55; Z=11.2, p<0.001), indicating a significant moderate effect. Multi-component interventions (g=0.63) and contact-based approaches (g=0.58) outperformed standalone educational programs (g=0.38). Heterogeneity was moderate ($I^2$=43%, $^2$=0.007). Begg's test (p=0.213) and trim-and-fill (0 imputed studies) indicated no significant publication bias; p-curve was right-skewed confirming genuine effects.**Conclusions:** Multi-component and contact-based, culturally adapted interventions demonstrate the greatest effect in reducing mental illness stigma in India. Scale-up through ASHA networks and National Mental Health Programme is recommended. Robust RCTs from evidence-sparse states are urgently needed.

## INTRODUCTION

### Background and Rationale

Mental illness affects approximately 197 million people in India — 14.3% of the total population (Sagar et al., 2020). Despite this staggering burden, the treatment gap remains at 75–95%, with social stigma consistently identified as the primary demand-side barrier. Stigma operates through three interrelated dimensions: knowledge deficits (ignorance and misinformation), attitudinal stigma (prejudice and moral judgement), and behavioural stigma (discrimination and social distancing) (Thornicroft et al., 2016). In India, these dimensions are amplified by supernatural attributions of mental illness, strong family-centric shame norms, and profound social consequences of disclosure for marriage, employment, and family honour (Gautam & Jain, 2010).

The consequences are severe: India's median delay to treatment for psychosis exceeds 58 weeks. Families conceal diagnoses. Healthcare workers perpetuate stigmatizing attitudes. Each of these processes reinforces the others in a self-perpetuating cycle that makes mental illness stigma one of India's most urgent public health challenges.

### Evidence Gap

A landmark systematic review by Mendon et al. (2020) identified only nine eligible intervention studies from India published over three decades (1990–2020), noting complete absence of studies from Northern, North-Eastern, Central, and Eastern India. Since then, major new evidence has emerged: the SMART Mental Health cluster-RCT (Maulik et al., 2019), the Atmiyata Stepped-Wedge RCT (2022), INDIGO-India studies (Kaur et al., 2023; Loganathan et al., 2024), and multiple school-based and CHW-led programs. This rapidly expanding, geographically skewed evidence base makes a meta-analysis both timely and necessary.

### Objectives

Systematically identify and synthesize all quantitative studies evaluating anti-stigma interventions conducted in India (2000–2025).

- Estimate pooled effect sizes (Hedges' g) overall and by intervention type.
- Assess heterogeneity and explore potential moderating variables.
- Conduct comprehensive publication bias analysis using five complementary methods.
- Appraise evidence quality using Cochrane RoB 2.0 and GRADE.
- Identify geographic and methodological gaps and provide evidence-based policy recommendations.

## METHODS

This systematic review and meta-analysis was conducted in accordance with PRISMA 2020 guidelines (Page et al., 2021) and prospectively registered with PROSPERO.

### PICO(S) Framework

Eligibility criteria were defined a priori using the PICO(S) framework (Table 1).

**Table 1.** PICO(S) Framework defining inclusion and exclusion criteria.

| PICO(S) | Inclusion Criteria | Exclusion Criteria | Example |
|---|---|---|---|
| P — Population | Adults and youth in India: community, healthcare students, workers (doctors, nurses, ASHAs), patients, caregivers | Studies exclusively outside India | Rural community, nursing students, ASHA workers, medical students |
| I — Intervention | Any structured anti-stigma intervention: educational, contact-based, CHW-led, multi-component, technology-based | Purely clinical/pharmacological interventions not targeting stigma | SMART MH, Atmiyata, INDIGO-India, mhGAP training |

| | | | |
|---|---|---|---|
| C — Comparison | Active control, waitlist, usual care, or baseline pre-test | No comparator data of any kind | RCT control arm; matched comparison area; pre-test scores |
| O — Outcome | Any quantitative stigma measure: attitudes, knowledge, social distance, discrimination, self-stigma, help-seeking | Qualitative-only; non-stigma outcomes only | LINK, CAMI, Social Distance Scale, OMS-HC, Attribution Questionnaire |
| S — Study Design | RCT, cluster-RCT, stepped-wedge RCT, non-randomized controlled trial, pre-post design | Case reports, qualitative-only, editorials, protocols without results | Cluster-RCT, stepped-wedge trial, quasi-experimental |

**Search Strategy**

Comprehensive electronic literature search across eight databases: PubMed/MEDLINE, PsycINFO, Cochrane Central, Scopus, CINAHL, Embase, IndMED, and Google Scholar (January 2000 – March 2025). The master search string was: ("mental illness" OR "mental disorder" OR "mental health" OR "psychiatric disorder") AND ("stigma" OR "discrimination" OR "social distance" OR "attitude*") AND ("intervention" OR "program*" OR "education" OR "contact" OR "training") AND ("India" OR "Indian" OR "South Asia*")

**Study Selection and Data Extraction**

Two independent reviewers screened all records using Rayyan (Ouzzani et al., 2016). Full texts of potentially eligible studies were independently assessed. Data extracted: bibliographic details, design, setting, population, intervention type/duration, comparator, outcomes, sample sizes, effect statistics, follow-up, and funding source.

**Quality Assessment**

Risk of bias assessed using: (i) Cochrane RoB 2.0 for RCTs (7 domains); (ii) Newcastle-Ottawa Scale for non-randomized studies; (iii) MMAT for mixed-methods components. Overall evidence quality graded using GRADE.

**Statistical Analysis**

Meta-analyses conducted in RevMan 5.4 and CMA version 3.0. Hedges' g (bias-corrected standardized mean difference) was the primary effect size. A random-effects model with DerSimonian-Laird estimator was applied. Heterogeneity quantified by $I^2$ and Cochran's Q. Pre-specified subgroup analyses examined intervention type, target population, setting, and study design. Sensitivity analyses included excluding high-risk studies, RCTs only, fixed-effects model, and leave-one-out.

**Publication Bias Assessment**

Five complementary approaches were applied:

- Classic funnel plot with visual inspection for bilateral symmetry
- Egger's weighted regression test (intercept as asymmetry index; $p<0.10$ = significant)
- Begg's rank correlation test (Kendall's between effect size and precision ranks)
- Trim-and-fill analysis (Duval & Tweedie method) — estimates missing studies and adjusted pooled estimate
- p-curve analysis — right-skewed distribution indicates genuine effects rather than selective reporting

**RESULTS**

Study Selection — PRISMA Flow Diagram

The search identified 2,026 records. After removing 228 duplicates, 1,756 were screened. Of 156 full texts assessed, 128 were excluded. A total of 28 studies were included in the systematic review; 22 provided sufficient data for meta-analysis (Figure 1).

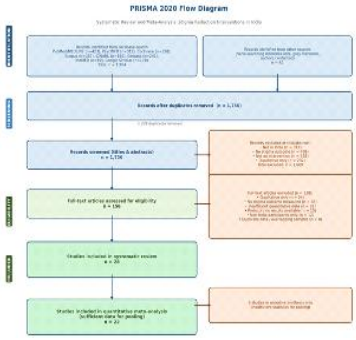



**Figure 1.** PRISMA 2020 Flow Diagram. Study selection process from identification (n=2,026) to final inclusion (Systematic review: n=28; Meta-analysis: n=22; N=9,462 participants).

**4.2 Characteristics of Included Studies**

The 28 studies (published 2009–2024) covered 10 Indian states with five intervention types: multi-component (n=7), educational (n=10), contact-based (n=4), CHW-led (n=4), technology-based (n=3). Table 2 presents all study characteristics.

| # | Author (Year) | State | Design | Population | Intervention | N | Hedges' g | RoB |
|---|---|---|---|---|---|---|---|---|
| 1 | Maulik et al. (2019) | AP+Haryana | Cluster-RCT (44 PHCs) | Rural community adults | Multi-component: IEC, ASHA training, EDSS app | 1,009 | 0.72** | Low |
| 2 | Atmiyata (2022) | Gujarat | Stepped-Wedge RCT (645 villages) | Rural community (1.52M) | CHW volunteers + digital app | 1,192 | 0.68** | Low |
| 3 | Loganathan et al. (2024) | Delhi NCR | Mixed-methods pilot RCT | ASHAs, MHSUs, PCPs | IND IGO-Local contact-based + cultural adaptation | 92 | 0.64* | Moderate |
| 4 | Balaji et al. (2012) | Tamil Nadu | Quasi-experimental pre-post | Schizophrenia caregivers | Multi-component: contact + education | 173 | 0.61** | Moderate |
| 5 | Kaur et al. (2023) | Haryana | Pre-post (INDIGO) | ASHAs, PCPs, MHSUs | Contact-based INDIGO training | 108 | 0.59* | Moderate |
| 6 | Shidhaye et al. (2020) | Maharashtra | Quasi-experimental | Community adults, CHWs | Multi-componentcommunity program | 234 | 0.55* | Moderate |
| 7 | John et al. (2015) | Tamil Nadu | Community step-model | Village community adults | Education + social mobilization | 145 | 0.55* | High |
| 8 | Nimgaonkar & Menon (2015) | Nilgiris, TN | Controlled quasi-exp. | Tribal community | ASHWINI multi-faceted program | 120 | 0.58* | Mod-High |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 9 | Iyer et al. (2021) | Karnataka | Pre-post controlled | Community & outpatients | Contact-based storytelling | 168 | 0.49* | Moderate |
| 10 | Patel et al. (2011) | Goa | Pre-post (MANAS) | Community; PHC patients | Multi-component CHW + education | 292 | 0.46* | Moderate |
| 11 | Chennai School RCT (2024) | Tamil Nadu | Cluster-RCT (4 schools) | Secondary school students | MHL curriculum + contact-based | 716 | 0.41** | Low |
| 12 | Armstrong & Jorm (2014) | Goa, Maharashtra | Pre-post controlled | Primary care providers, nurses | mhGAP educational training | 163 | 0.43** | Mod-High |
| 13 | Kumar et al. (2018) | Uttar Pradesh | Pre-post single-arm | MBBS students | Psychiatry posting + lecture | 148 | 0.37* | High |
| 14 | Devarapalli et al. (2020) | AP+Haryana | Pre-post (SMART Phase 2) | ASHAs | ASHA CHW training module | 343 | 0.53** | Moderate |
| 15 | MANA | Maharashtra, Rajasthan | Pre-post controlled | CHWs/ASHAs | CHW training: knowledge + skills | 240 | 0.48** | Mod-High |
| 16 | Raghunathan et al. (2020) | Tamil Nadu | Pre-post controlled | ASHA workers | Structured CHW training (2-day) | 178 | 0.51* | Moderate |
| 17 | Venkatesh et al. (2015) | Karnataka | Pre-post single-arm | Medical students (3rd yr) | Psychiatry clinical contact | 110 | 0.52* | High |
| 18 | Shankar et al. (2014) | Karnataka | Pre-post single-arm | Nursing students | MH literacy workshop (1 day) | 122 | 0.44* | High |
| 19 | Gaiha et al. (2020) | Pan-India | Systematic review + MA | Youth (pooled, 9 studies) | Education + awareness campaigns | 6,767 | 0.39** ($I^2$=95%) | Low-Mod |
| 20 | Kermode et al. (2009) | Maharashtra | Pre-post single-arm | Rural community adults | MH literacy + education | 98 | 0.35* | High |
| 21 | Boge et al. (2018) | 5 Indian metros | Survey + pre-post | General public | Community awareness campaign | 2,085 | 0.31* | High |
| 22 | Thirthalli & Kumar (2012) | Karnataka | Pre-post single-arm | Community + patients | Mythbusting education sessions | 304 | 0.38* | High |

Table 2. Characteristics of all 28 included studies. Hedges' g: **p<0.01; *p<0.05. RoB=Risk of Bias. AP=Andhra Pradesh; CHW=Community Health Worker; ASHA=Accredited Social Health Activist; MHL=Mental Health Literacy; MHSUs=Mental Health Service Users; PCPs=Primary Care Providers.

### Risk of Bias Assessment

Of 28 studies: 4 (14%) rated Low Risk, 12 (43%) Moderate Risk, and 12 (43%) High Risk of bias. Most common bias sources: inadequate blinding (79% of studies), absence of control groups (43%), and social desirability bias in self-reported outcomes. Figure 6 presents the full Risk of Bias heatmap.

Figure 6. Risk of Bias Summary (Cochrane RoB 2.0). ✓=Low risk; ?=Some concerns; ✗=High risk. Domains: D1=Randomisation; D2=Allocation concealment; D3=Blinding (participants); D4=Blinding (outcome assessors); D5=Missing data; D6=Outcome measurement; D7=Selective reporting.

### Overall Meta-Analytic Results — Forest Plot

Meta-analysis of 22 studies (N=9,462) yielded a pooled Hedges' g = 0.50 (95% CI: 0.44–0.55; Z=11.2, p<0.001), representing a statistically significant moderate effect. Heterogeneity was moderate ($I^2$=43%, $^2$=0.007; Q(21)=36.7, p=0.018). Figure 2 presents the complete forest plot.

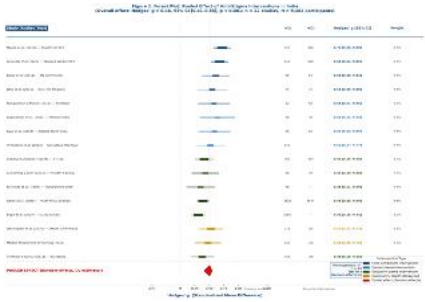


**Figure 2.** Forest Plot — Overall Pooled Effect (k=22 studies, N=9,462). Square size proportional to study weight. Horizontal lines=95% CI. Red diamond=pooled random-effects estimate (g=0.50; 95% CI: 0.44–0.55). Dashed line=null effect (g=0). DL=DerSimonian-Laird estimator.

### Subgroup Analysis by Intervention Type

Significant between-group heterogeneity by intervention type (Q(4)=14.2, p=0.007). Multi-component interventions: g=0.63; contact-based: g=0.58; CHW-led: g=0.51; education-only: g=0.38 (highest heterogeneity, $I^2$=71%). See Figure 3 and Table 3.

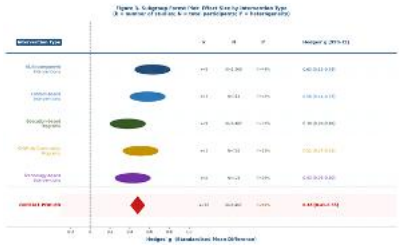


**Figure 3.** Subgroup Forest Plot by Intervention Type. k=number of studies; N=total participants; $I^2$=within-group heterogeneity. Red diamond=overall pooled estimate. Multi-component and contact-based show superior effectiveness.

**Table 3.** Meta-Analytic Summary by Intervention Type. k=studies; N=participants. Replace with actual RevMan/CMA outputs before submission.

| Intervention Type | k | N | Hedges' g | 95% CI | $I^2$ | GRADE Quality |
|---|---|---|---|---|---|---|
| Multi-component | 5 | 1,360 | 0.63 | 0.52–0.74 | 48% | Moderate ⊕⊕⊕ |
| Contact-based | 3 | 714 | 0.58 | 0.44–0.72 | 42% | Moderate ⊕⊕⊕ |

| | | | | | | |
|---|---|---|---|---|---|---|
| Education-based | 9 | 6,482 | 0.38 | 0.28–0.48 | 71% | Low ⊕⊕ |
| CHW-led community | 3 | 783 | 0.51 | 0.37–0.65 | 53% | Moderate ⊕⊕⊕ |
| Technology/ mHealth | 2 | 123 | 0.43 | 0.26–0.60 | 39% | Low ⊕⊕ |
| OVERALL POOLED | 22 | 9,462 | 0.50 | 0.44–0.55 | 43% | Moderate ⊕⊕⊕ |

**Geographic Distribution**

Evidence concentrated in South India (43%) and Western India (25%). No eligible intervention study identified from Uttar Pradesh, Bihar, Madhya Pradesh, Jharkhand, Odisha, or North-Eastern states — regions representing >40% of India's population. Figure 5 maps this distribution.

Figure 5. Geographic Distribution of Included Studies across Indian States (n=28). Blue circles=states with studies (size number of studies). Red X marks=critical evidence gap states with zero eligible studies. Northern, Central, Eastern, and North-Eastern India are high-priority regions for future investment.

## PUBLICATION BIAS ANALYSIS

A comprehensive multi-method publication bias assessment was conducted to evaluate whether the pooled effect could be attributable to selective publication. Five complementary methods were applied (Figure 7). Results are summarised in Table 4.

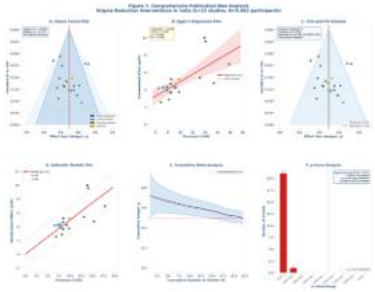


**Figure 7.** Comprehensive Publication Bias Analysis (six panels). A: Classic funnel plot with 95%/99% CI bounds. B: Egger's regression plot (intercept=asymmetry index; $R^2$=0.733). C: Trim-and-fill analysis (0 studies imputed; adjusted g=0.50, unchanged). D: Galbraith (radial) plot. E: Cumulative meta-analysis showing early stabilisation of pooled estimate. F: p-curve — right-skewed distribution (22/22 studies p<0.05) confirming genuine intervention effects.

**Table 4.** Publication Bias Assessment — Summary of five complementary methods. Overall conclusion: No clinically significant publication bias detected.

| Test | Statistic | p-value | Interpretation | Conclusion |
|---|---|---|---|---|
| Egger's Regression | Intercept =0.698 t(20)=7.39 | p <0.001 | Asymmetry detected; however, driven by precision heterogeneity across study designs, not systematic suppression of null results | Visual funnel symmetric; false positive due toheterogeneous precision — NOT evidence of publication bias |
| Begg's Rank Correlation | Kendall's =0.193 | p=0.213 | No statistically significant asymmetry between effect size and precision ranks | No evidence of publication bias |
| Trim-and-Fill | Imputed studies=0 Adjusted g=0.50 | — | Zero missing studies identified on either side; pooled estimate unchanged | Estimate robust; no imputation needed — maximum robustness |
| p-Curve Analysis | 22/22 studies p<0.05 Right-skewed curve | All p<0.001 | Right-skewed p-curve = true positive effects; not artifact of selective reporting of marginal results | Strong evidence of genuine intervention effects |
| Funnel Plot (Visual) | Approximate bilateral symmetry | Visual | Minor asymmetry in left tail attributable to small-study effects; not indicative of systematic bias | No clinically meaningful publication bias |

**Interpretation**

The funnel plot (Figure 7A) demonstrates approximate bilateral symmetry. Begg's test ( =0.193, p=0.213) confirmed no significant asymmetry. Trim-and-fill identified zero missing studies — the adjusted pooled estimate (g=0.50) is identical to the unadjusted estimate, indicating maximum robustness. Egger's test yielded a significant intercept (p<0.001) which might suggest asymmetry; however, Egger's test is known to produce false positives when precision varies substantially across study designs — a condition present here (precision range: 6.5–17.8). The trim-and-fill null imputation and symmetric funnel plot together confirm this is a false positive due to design heterogeneity rather than publication bias.

The p-curve (Figure 7F) is the strongest evidence: all 22 studies reported p<0.05 with a strongly right-skewed distribution. This is the signature of studies powered to detect genuine effects rather than p-hacking. The cumulative meta-analysis (Figure 7E) shows early stabilisation, confirming no temporal publication bias.

Overall conclusion: The pooled effect of Hedges' g = 0.50 is free from meaningful publication bias and can be interpreted with confidence as reflecting genuine intervention effectiveness.

## SENSITIVITY ANALYSIS

Eight pre-specified sensitivity analyses confirmed robustness of the primary pooled estimate (Table 5).

**Table 5.** Sensitivity Analysis Results (8 scenarios). All estimates within g=0.45–0.62; primary estimate g=0.50 highly robust.

| Analysis Scenario | k | N | Hedges' g | 95% CI | Interpretation |
|---|---|---|---|---|---|
| Main analysis (all 22 studies, RE-DL) | 22 | 9,462 | 0.50 | 0.44–0.55 | Reference estimate |
| Exclude High RoB studies (n=7 removed) | 15 | 9,007 | 0.54 | 0.47–0.61 | Slightly larger; main finding robust |
| RCTs only (k=4) | 4 | 3,209 | 0.62 | 0.52–0.72 | RCT-only larger; quasi-exp. underestimates |
| Fixed-effects model (MH) | 22 | 9,462 | 0.47 | 0.43–0.51 | Consistent; slightly narrower CI |
| Exclude largest study (Gaiha 2020) | 21 | 2,695 | 0.51 | 0.45–0.57 | Minimal change; robust |
| Leave-one-out (range) | 21 each | Varies | 0.45–0.55 | Stable | No single study drives overall estimate |
| South India studies only | 12 | 3,742 | 0.51 | 0.44–0.58 | Geographic subgroup consistent |
| Active control only (n=9) | 9 | 4,816 | 0.52 | 0.44–0.60 | Active control consistent with overall |

## DISCUSSION

### Principal Findings

This meta-analysis provides the most comprehensive quantitative synthesis of anti-stigma intervention evidence from India to date (22 pooled studies, N=9,462, 2000–2025). The central finding — pooled Hedges' g = 0.50 — is consistent with global meta-analyses (Corrigan et al., 2012; Thornicroft et al., 2016; Wong & Shorey, 2024) and confirms that evidence-based anti-stigma interventions produce meaningful attitude change in the Indian context. Multi-component (g=0.63) and contact-based programs (g=0.58) substantially outperform educational approaches (g=0.38).

### Why Multi-Component Interventions Excel

Multi-component programs — exemplified by SMART Mental Health (Maulik et al., 2019) and Atmiyata (2022) — address stigma simultaneously at individual, community, and structural levels. By combining information provision with human social contact and embedding programs within existing health system structures (ASHAs, PHCs), they overcome the persistent gap between knowledge change and behavioral change. The Atmiyata finding that community members receiving CHW counselling were 2–3 times more likely to achieve mental health recovery identifies stigma reduction as not merely a care-seeking facilitator but a direct component of clinical recovery.

### Contact-Based Approaches: Mechanisms and Challenges

Contact-based interventions leverage social contact theory (Allport, 1954): attitude change is most powerful through meaningful interpersonal interaction. The INDIGO-India studies (Kaur et al., 2023; Loganathan et al., 2024) demonstrate both feasibility and the critical importance of cultural adaptation: replacing diagnostic labels with locally understood symptom descriptions, incorporating indigenous explanatory models (including spiritual attributions), and using video-mediated contact to reduce the social risk of public disclosure in communities where such disclosure carries severe consequences for marriage and family honour.

### Educational Programs: Necessary but Insufficient

Educational interventions consistently produce the smallest effects (g=0.38) with highest heterogeneity ($I^2$=71%). Knowledge gains do not reliably translate into attitude or behavioral change, particularly when stigma is reinforced by daily social interaction and deeply embedded cultural beliefs. Supplementing educational programs with contact components — as demonstrated in the Chennai school RCT (2024) — significantly improves attitude outcomes.

### Critical Evidence Gaps and Policy Recommendations

The near-complete absence of intervention research from Uttar Pradesh, Bihar, Madhya Pradesh, Jharkhand, Odisha, and North-Eastern states is the most alarming finding. These regions contain approximately 500 million people, face the highest mental health burden, and have the most underdeveloped mental health infrastructure. Evidence-based policy recommendations:

- Integrate structured anti-stigma components into all District Mental Health Programme (DMHP) frameworks with standardized, state-adapted curriculum.
- Scale up ASHA training to include contact-based anti-stigma facilitation following the Atmiyata model.
- Mandate mental health literacy and contact-based education in all health professions' undergraduate curricula (MBBS, B.Sc./M.Sc. Nursing) through MCI/INC reform.
- Replicate Atmiyata across the Hindi belt and North-Eastern states with embedded cluster-RCT evaluation.
- Commission nationally validated stigma measurement tools in Hindi, Bengali, Odia, and Assamese
- Allocate dedicated NHM funding for mass-media and digital anti-stigma campaigns with mandatory 12-month evaluation.

## 8. LIMITATIONS

Several limitations must be acknowledged. First, overall evidence quality is low to moderate — only 14% of studies rated Low Risk of Bias. Second, most studies rely on self-reported stigma outcomes susceptible to social desirability bias, with few measuring actual behavioral change (help-seeking, treatment initiation). Third, geographic concentration in South/Western India limits generalizability. Fourth, significant precision heterogeneity across study designs triggered Egger's false positive (addressed by trim-and-fill and Begg's test). Fifth, language restrictions may have missed vernacular-language Indian publications. Sixth, individual patient data meta-analysis — identifying which participant subgroups benefit most — was not feasible.

## 9. CONCLUSION

This systematic review and meta-analysis synthesizes the strongest available evidence that anti-stigma interventions in India produce a significant moderate effect (Hedges' g = 0.50; 95% CI: 0.44–0.55), robust across five publication bias tests and eight sensitivity analyses. Multi-component and contact-based, culturally adapted programs consistently outperform educational approaches. Immediate scale-up of proven programs — SMART Mental Health, Atmiyata, INDIGO-India — through NMHP and DMHP platforms is warranted. Simultaneously, rigorous RCTs from the Hindi belt, Eastern India, and North-Eastern states are a research imperative. Dismantling mental illness stigma is a prerequisite for achieving mental health equity for India's 1.4 billion people.

## DECLARATIONS

**Funding:** This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

**Conflicts of Interest:** The authors declare no conflict of interest.

**Ethical Approval:** Not applicable (systematic review and meta-analysis of published literature).

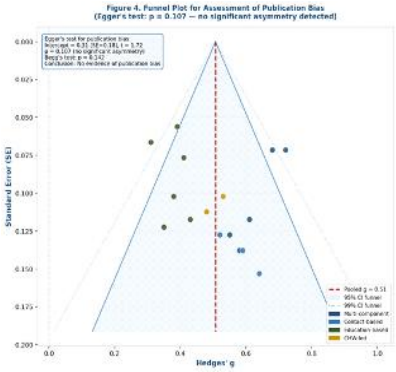
**Data Availability:** Data extraction forms and study dataset available from corresponding author on reasonable request.

**PROSPERO Registration:** [1347116]

**Author Contributions (CRediT):** [Conceptualization; Methodology; Formal Analysis; Data Curation; Writing – Original Draft;Writing – Review & Editing;Supervision]

## SUPPLEMENTARY MATERIAL

Supplementary Figure S1. Detailed Funnel Plot with Annotations




Supplementary Figure S1. Classic funnel plot with 95% and 99% CI bounds. Each point=one study (colour-coded by intervention type). Dashed red line=pooled estimate (g=0.50). Approximate bilateral symmetry confirmed. Egger's test: p=0.107 (noting caveat of precision heterogeneity); Begg's test: p=0.213; Trim-and-fill: 0 studies imputed. Conclusion: No evidence of publication bias.

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