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**Original Research Article**

# Effectiveness of a self-instructional module in enhancing pre-service teacher trainees' knowledge and attitudes towards children with Attention-Deficit Hyperactivity Disorder: a multicentre study

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## ABSTRACT

**Background:** Attention-Deficit/Hyperactivity Disorder (ADHD) is a common neurodevelopmental disorder affecting children's academic, behavioural, and social functioning. Teachers play a vital role in early identification and classroom management of children with ADHD; however, inadequate knowledge and negative attitudes among teacher trainees remain a concern. This study evaluated the effectiveness of a Self-Instructional Module (SIM) in improving knowledge and attitudes regarding ADHD among pre-service teacher trainees.
**Methods:** A multicentric pre-experimental one-group pre-test-post-test study was conducted among 203 pre-service teacher trainees selected through simple random sampling from teacher-training institutions in Tamil Nadu, South India. Data were collected using a structured knowledge questionnaire and a five-point Likert attitude scale before and after administration of the SIM. Data were analysed using descriptive and inferential statistics.
**Results:** The mean post-test knowledge score significantly increased from 9.84±2.31 to 16.27±2.08 ($t=24.63$, $p<0.001$). The mean attitude score also improved significantly from 61.72±7.85 to 81.64±6.93 ($t=20.17$, $p<0.001$). A positive correlation was observed between knowledge and attitude scores both before ($r=0.46$) and after intervention ($r=0.58$).
**Conclusions:** The Self-Instructional Module was effective in improving knowledge and fostering positive attitudes towards children with ADHD among pre-service teacher trainees. Incorporating structured ADHD education into teacher-training curricula may promote inclusive educational practices.

**Keywords:** Attention-deficit/hyperactivity disorder, Attitude, Inclusive education, Knowledge, Pre-service teachers, Self-instructional module

## INTRODUCTION

The emotional well-being of children forms the foundation for a nation's social and economic resilience. Among childhood neurodevelopmental conditions, Attention-Deficit/Hyperactivity Disorder (ADHD) is one of the most prevalent and persistent, influencing learning, behaviour, and social functioning. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR), ADHD is characterized by a persistent pattern of inattention and/or hyperactivity-impulsivity

that interferes with development or daily functioning.[1] A Meta-analytic data indicate a global ADHD prevalence of approximately 8%, with rates nearly twice as high in boys.[2] Although overt hyperactivity may diminish with age, symptoms such as inattention, disorganization, and poor impulse control frequently persist into adolescence and adulthood, leading to impaired academic performance, psychosocial difficulties, and an increased risk of depression, anxiety, and substance use.[3,4]

In India, ADHD has emerged as a significant yet under-recognized public-health concern. A recent survey reported 8.8% primary-school children have been diagnosed with ADHD, reflecting comparable global patterns.[5] However, teacher awareness and preparedness remain inadequate. Teachers are often the first to notice behavioral deviations in the classroom, making their knowledge and attitudes crucial for early identification, referral, and effective classroom management.[6] Although evidence-based interventions such as behavioral therapy, structured routines, and pharmacological treatment are available, many children remain undiagnosed or untreated due to persistent gaps in teacher training and misconceptions about the disorder.[7] Incorporating ADHD education into teacher-training curricula can strengthen early detection, promote inclusive classroom practice, and improve parent–teacher collaboration.[8-9]

There is a dire need to enhance primary teachers' knowledge and attitudes towards children with ADHD to recognize, support, and include them in mainstream classrooms. The global burden of ADHD continues to rise, yet recognition and response within educational settings remain suboptimal. The CDC National Health Interview Survey (2023) reported that 11.3% of U.S. children aged 5-17 years had been diagnosed with ADHD, while pooled international estimates from 2021 indicated a prevalence of 7.6% in children under 12 years and 5.6% in adolescents.[10,2] Although, Indian data mirror these trends, awareness among teacher trainees remains insufficient.[5-11]

Across countries, research consistently documents deficits in teachers' factual understanding of ADHD. Published evidence reported a majority of teachers reported that a majority of the participants had an adequate knowledge on core symptoms of ADHD. However, majority of the participants were unaware of evidence-based management strategies.[17-21] On the contrary, a recent study reported widespread misconceptions regarding the causes and treatment of ADHD.[18] In India, a quasi-experimental trial employing a Self-Instructional Module (SIM) significantly improved teacher trainees' ADHD knowledge ($p<0.001$), findings echoed in Saudi Arabia following short digital workshops.[19,20]

Teacher attitudes are equally influential in shaping classroom inclusion and referral patterns. In Oman, half of teachers still viewed ADHD as a behavioural rather than neurodevelopmental condition, while 42% of Ethiopian teachers expressed negative attitudes linked to inadequate training.[22,23] Studies from South Korea and Malaysia demonstrated significant attitude improvements after targeted psycho-educational interventions, reinforcing the value of structured learning programs.[24,25] Knowledge and attitude are strongly correlated ($r=0.52$; $p<0.01$), and an Indian study conducted in Tamil Nadu confirmed that self-learning modules enhanced both, with female trainees showing slightly higher empathy.[26,27] Evidence from South Africa and Australia further indicates that improved factual understanding enhances teacher self-efficacy and reduces frustration in classroom management.[28,29]

Knowledge and attitude gaps are not confined to teachers alone. Only 21% of Indian general practitioners and 32% of paediatricians could accurately identify ADHD, and similar awareness deficits have been observed among parents and health-science students.[30,32,33] Collectively, these findings underscore the need for structured, nurse-facilitated educational modules aimed at pre-service teacher trainees to strengthen both cognitive and affective competencies related to ADHD, bridging educational and mental-health domains.

Empirical evidence from multiple contexts, therefore, justifies the present multicentric study. Empowering pre-service teacher trainees through a self-paced educational approach represents a novel and scalable strategy to close the knowledge-attitude gap in ADHD management. A Self-Instructional Module (SIM), designed as a structured, evidence-based learning package, offers a feasible solution for enhancing conceptual understanding, empathy, and inclusive-classroom competence.[14,15] Against this background, the current investigation was undertaken to evaluate the effectiveness of SIM on ADHD among pre-service teacher trainees in selected districts of Tamil Nadu, South India, addressing a critical intersection between education and mental health.

The study aimed to assess baseline knowledge and attitudes regarding ADHD among pre-service teacher trainees, evaluate the effectiveness of SIM in improving these outcomes, and examine associations between post-intervention knowledge and attitude scores with selected socio-demographic variables. The hypothesis proposed that mean post-test knowledge and attitude scores would be significantly higher than pre-test scores ($p<0.05$) and that post-test outcomes would exhibit significant associations with socio-demographic characteristics such as age, education, and prior exposure to ADHD-related information. The Self-Instructional Module functioned as the independent variable, while post-test knowledge and attitude scores represented the dependent variables. Participant characteristics including age, gender, religion, marital status, educational qualification, family income, family type, and prior exposure to ADHD information were treated as covariates. Effectiveness was defined as a statistically significant improvement in knowledge or

attitude following exposure to the SIM. The module consisted of a structured, self-paced, evidence-based package developed by the investigator to enhance ADHD-related understanding. Knowledge denoted cognitive awareness measured through a 20-item structured questionnaire, while attitude referred to affective and behavioral disposition assessed using a 20-item five-point Likert scale. ADHD was defined as a neurodevelopmental disorder characterized by persistent inattention and/or hyperactivity-impulsivity that interferes with adaptive functioning, as per the DSM-5-TR (2022). Pre-service teacher trainees were defined as second-year students enrolled in Diploma-in-Education programs preparing them for elementary-level teaching.

## METHODS

### *Design and setting*

This multicentric evaluative study employed a pre-experimental one-group pre-test-post-test design to assess the effectiveness of a Self-Instructional Module (SIM) in improving knowledge and attitudes regarding Attention-Deficit/Hyperactivity Disorder (ADHD) among pre-service teacher trainees in South India. This design was chosen for its methodological appropriateness in educational-intervention research where randomization is logistically constrained, allowing each participant to serve as their own control and enabling precise within-subject comparison of change attributable to the intervention.

The study was conducted in three accredited teacher-training institutions located across randomly selected districts of Tamil Nadu, representing a socio-educational cross-section of the state's northern corridor. These districts include both government-aided and private colleges offering Diploma-in-Education (D.Ed.) programs, thereby encompassing diverse pedagogical contexts and learner backgrounds. Situated along the Bengaluru-Salem educational belt, these institutions prepare trainees for early-childhood and primary-school teaching levels where timely identification and management of behavioral and learning difficulties such as ADHD are essential to inclusive-education practice.

### *Diploma education training (primary school teachers)*

### *Participants and sampling*

The study population comprised second-year D.Ed. students from the three participating teacher-training institutions. (38 districts). This cohort was randomly (lottery method) chosen because trainees at this stage had completed foundational coursework in child development and pedagogy but had not yet received structured instruction on neurodevelopmental disorders, making them suitable for evaluating the educational impact of a nurse-led intervention.

A simple random-sampling technique was applied to achieve representativeness and minimize selection bias. Lists of eligible second-year trainees from each institution served as sampling frames; participants were randomly selected using computer-generated random numbers to ensure equal probability of inclusion across centers.

This study included trainees those were in the final year of the D.Ed. program and participants with prior exposure to any ADHD-related training or awareness program were excluded. Of the 210 trainees approached, 203 met the eligibility criteria and completed all study phases, resulting in a participation (completion) rate of 96.7%.

An a priori power analysis using GPower 3.1 confirmed statistical adequacy. For a two-tailed test at $\alpha = 0.05$, power = 0.90, and medium effect size ($d = 0.5$), the minimum required sample size was 180. The final sample of 203 thus exceeded this threshold, ensuring sufficient power to detect meaningful pre- to post-intervention differences. The sample reflected balanced representation from government-aided and private institutions across the three districts, enhancing the generalizability of findings to comparable teacher-education settings in Tamil Nadu.

### *Instruments and measures*

Three structured instruments, developed by the research team were used for data collection:

Part I: Socio-demographic proforma eliciting ten variables age, gender, marital status, religion, educational qualification, family type, monthly family income, place of domicile, prior exposure to ADHD information, and family history of ADHD.

Part II: Knowledge questionnaire consisting of 20 multiple-choice items covering core domains: definition, etiology, symptomatology, management, and the teacher's role in supporting children with ADHD. Each correct response scored one point (range = 0–20), with higher scores indicating greater factual understanding.

Part III: Attitude scale comprising 20 statements rated on a five-point Likert scale from strongly disagree (1) to strongly agree (5). Ten positively worded and ten negatively worded items were included to minimize acquiescence bias, yielding total scores between 20 and 100; higher scores denoted more favourable attitudes toward children with ADHD.

In this study, the independent variable was the Self-Instructional Module, and the dependent variables were post-intervention knowledge and attitude scores. Socio-demographic variables served as covariates for secondary analyses. Effectiveness was operationally defined as a statistically significant improvement in post-test scores for knowledge and attitude after exposure to the SIM.

To ensure instrument validity and reliability, content validity was established through expert review by specialists in psychiatric nursing, pediatric nursing, psychology, and educational research. The overall Content Validity Index (CVI) was 0.94, indicating strong expert consensus. Reliability assessed via the split-half method and Spearman-Brown prophecy formula yielded coefficients of r=0.945 (knowledge) and r=0.990 (attitude), confirming excellent internal consistency. Readability analysis using the Flesch-Kincaid Grade-Level test produced a score of 8.4, verifying suitability for the linguistic and cognitive level of undergraduate teacher trainees.

***Intervention: The Self-Instructional Module (SIM)***

The Self-Instructional Module (SIM) was designed as an evidence-based, learner-centred educational innovation aimed at enhancing teacher-trainees' knowledge and attitudes toward ADHD. Development was guided by three international instructional frameworks: the Analysis-Design-Development-Implementation
Evaluation (ADDIE) model for systematic curriculum planning, Bloom's Taxonomy for cognitive hierarchy, and the Kirkpatrick Four-Level Model for outcome evaluation. Integration of these frameworks ensured pedagogical rigor, coherence, and measurable learning outcomes.

The process began with a needs-assessment phase, during which thirty representative trainees participated in a survey and focus-group discussion facilitated by the nurse-researcher. This formative evaluation revealed conceptual gaps especially misconceptions attributing ADHD to parenting style or diet and informed the learning objectives and content priorities of the SIM.

During the design and development stages, learning objectives were structured progressively from remembering to analysing (per Bloom's taxonomy). Content was organized for self-paced study with embedded scaffolding for learner engagement. Each unit integrated concise text, diagrams, flowcharts, classroom vignettes, and culturally contextualized examples from Tamil-medium schools. "Pause-and-Think" reflection boxes promoted metacognitive engagement, and brief scenario-based self-tests reinforced learning.

The preliminary draft underwent multidisciplinary expert validation by faculty from psychiatric nursing, pediatric nursing, educational psychology, and instructional design. Following a pilot test with six non-sample trainees, minor revisions were made to terminology, sequencing, and layout to optimize clarity and flow.

The final SIM comprised five thematic units: 1) Overview and epidemiology of ADHD; 2) Diagnostic criteria and clinical features (DSM-5-TR); 3) Etiological factors and risk determinants; 4) Multimodal management integrating behavioral, pharmacological, and educational strategies; and 5) The teacher's role in early identification, referral, and inclusive-classroom facilitation.

Each unit concluded with a self-evaluation quiz and a "Take-Home Reflection" linking theory to classroom practice. The module was distributed in dual formats, a printed booklet and a digitally enriched version hosted on Google Classroom. The digital version incorporated QR-linked micro-learning videos (3-5 minutes), interactive reflection prompts, and gamified self-check quizzes. This hybrid design aligned with global best practices in digital pedagogy, enabling accessibility and sustained engagement.

During the implementation phase, participants were oriented to the module and given six days for independent study. The nurse-researcher provided asynchronous guidance through Google Classroom discussions. Evaluation followed the Kirkpatrick Model: Level 1 (Reaction) captured satisfaction and perceived relevance; Level 2 (Learning) assessed gains through pre- and post-test comparisons. This structured approach ensured participant-centered, evidence-driven evaluation of learning outcomes.

***Procedure and data collection***

Data collection occurred between September and October 2024 across the three study sites in Tamil Nadu, executed in alignment with the ADDIE framework to ensure methodological fidelity.

Phase 1-Pre-test and Orientation: Participants received an introduction to the study objectives, confidentiality assurances, and provided electronic informed consent via a secure Google Form. The baseline (pre-test) assessment included the socio-demographic proforma, knowledge questionnaire, and attitude scale. Forms were configured to prevent duplicate entries, and responses were automatically anonymized and time-stamped.

Phase 2-Intervention Delivery: After baseline assessment, participants engaged with the SIM over six days through printed and digital formats. The Google Classroom platform enabled asynchronous discussion, reflective posts, and daily micro-quizzes. A mid-week virtual debriefing via Google Meet facilitated clarification of concepts and sharing of inclusive-education experiences, maintaining learner engagement throughout.

Phase 3-Post-test and Data Consolidation: On day 7, participants completed the post-test using the same validated tools within a two-hour access window per institution. Data were automatically logged in Microsoft Excel 2021, cleaned, coded, and imported into IBM SPSS version 26 for statistical analysis.

For interpretation, knowledge scores ≥15 (≥75%) denoted adequate knowledge, 10-14 (50-74%) moderate, and <10 (<50%) inadequate. Attitude scores 76-100 were categorized as positive, 51-75 neutral, and 20-50

negative. This framework allowed for both categorical and continuous analysis, quantifying cognitive and affective improvements attributable to the SIM.

### *Data analysis*

Data were verified for completeness, consistency, and range accuracy before statistical processing. All analyses were performed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics frequencies, percentages, means, and standard deviations (SD) were used to summarize socio-demographic variables and baseline characteristics.

Primary outcomes were knowledge and attitude scores related to ADHD. Pre- and post-intervention differences were analyzed using paired-sample t-tests, and results are presented as mean differences with 95% confidence intervals (CI). The effect size of the Self-Instructional Module (SIM) was estimated using Cohen's d (95% CI), interpreted as small (0.2), medium (0.5), or large (≥0.8).

Assumptions for parametric testing were checked by inspecting Q-Q plots and using the Shapiro-Wilk test on change scores (paired tests). For the mixed ANOVA, normality of residuals was examined; sphericity is not applicable with two time points.

To assess uniformity of learning gains across centers, a two-way mixed analysis of variance (ANOVA) was conducted with time (pre-test, post-test) as the within-subject factor and Site as the between-subject factor. The Time × Site interaction tested whether improvement magnitudes differed across locations. As a robustness check, a linear mixed-effects model (random intercepts for participants; fixed effects for time and site) was explored.

To identify predictors of post-intervention knowledge after accounting for baseline scores, an analysis of covariance (ANCOVA) was conducted with post-test knowledge as the dependent variable, pre-test knowledge as the covariate, and socio-demographic variables (prior ADHD information, parental education, gender, family type, site) as independent predictors.

The association between knowledge and attitude scores was examined using Pearson's product–moment correlation coefficient (r). Learning analytics (Google Form completion time and frequency of digital engagement within Google Classroom) were triangulated to verify participant compliance with the intervention. All tests were two-tailed, with statistical significance set at $p<0.05$.

### *Ethical considerations*

Ethical approval for the study was obtained from the Institutional Ethics Committee of the College of Nursing, National Institute of Mental Health and Neurosciences (NIMHANS), Bengaluru. Administrative permissions were subsequently secured from each of the participating teacher-training institutions in selected districts of Tamil Nadu. Participation was entirely voluntary, and informed consent was obtained electronically from all participants prior to data collection through a secure Google Form.

Confidentiality and anonymity were strictly maintained through coded identifiers, password-protected databases, and encrypted digital storage. No personally identifiable information was recorded or disclosed at any stage. Participants were informed of their right to withdraw from the study at any time without academic or personal consequence.

The study adhered to the ethical principles outlined in the Declaration of Helsinki (2013; reaffirmed 2022) and complied with the Indian Council of Medical Research (ICMR) National Ethical Guidelines for Biomedical and Health Research Involving Human Participants (2021). All study procedures were conducted in accordance with responsible research conduct, ensuring respect for participant autonomy, beneficence, and data protection.

## RESULTS

A total of 203 pre-service teacher trainees participated in this study (Table 1). The mean age of the participants was 21.6 (SD,1.4) years, with most (72%) aged 20-22 years. Most of the sample comprised of women (85.7%), unmarried (93.6%), and were from nuclear families (68%). More than half of the participants and reported a monthly family income between ₹15 000 and ₹30 000 (58%). Few of the participants (6%) have reported a family history of ADHD.

**Table 1: Socio-demographic characteristics of pre-service teacher trainees (n=203).**

| Variable | Category | Number | Percent |
|---|---|---|---|
| **Age (years)** | 18-20 | 42 | 20.7 |
| | 21-22 | 104 | 51.2 |
| | ≥23 | 57 | 28.1 |
| **Gender** | Female | 174 | 85.7 |
| | Male | 29 | 14.3 |
| **Marital status** | Unmarried | 190 | 93.6 |
| | Married | 13 | 6.4 |
| **Type of family** | Nuclear | 138 | 68.0 |
| | Joint/extended | 65 | 32.0 |
| **Monthly family income (₹)** | <15 000 | 41 | 20.2 |
| | 15000-30000 | 118 | 58.1 |
| | >30 000 | 44 | 21.7 |
| **Prior ADHD information** | Yes | 83 | 40.9 |
| | No | 120 | 59.1 |
| **Family history of ADHD** | Yes | 12 | 5.9 |
| | No | 191 | 94.1 |

ADHD = Attention-Deficit/Hyperactivity Disorder

***Pre-intervention knowledge and attitude***

Before exposure to the Self-Instructional Module (SIM), participants demonstrated limited awareness of ADHD. The mean pre-test knowledge score was 9.84 (SD, 2.31), with 57.1% exhibiting moderate knowledge, 29.6% inadequate, and 13.3% adequate (Table 2). Domain-wise, understanding of behavioural symptoms (M±SD, 2.91±0.64) exceeded that of aetiology (M±SD, 1.48±0.72) and management (M±SD, 1.26±0.68), revealing notable conceptual gaps.

**Table 2: Pre- and post-test knowledge scores on ADHD (n=203).**

| Variable | Mean±SD | Mean diff (95% CI) | t (df = 202) | p value | Cohen's d |
|---|---|---|---|---|---|
| **Pre-test knowledge** | 9.84±2.31 | | | | |
| **Post-test knowledge** | 16.27±2.08 | 6.43 (5.84 to 7.02) | 24.63 | <0.001*** | 1.21 (Large) |

SD = Standard Deviation; CI = Confidence Interval; *** p<0.001

**Table 3: Pre- and post-test attitude scores toward children with ADHD (n=203).**

| Variable | Mean±SD | Mean diff (95% CI) | t (df = 202) | p value | Cohen's d |
|---|---|---|---|---|---|
| **Pre-test knowledge** | 61.72±7.85 | | | | |
| **Post-test knowledge** | 81.64±6.93 | 19.92 (17.96 to 21.88) | 20.17 | <0.001*** | 1.09 (Large) |

SD = Standard Deviation; CI = Confidence Interval; *** p<0.001

The mean pre-test attitude score was 61.72 (SD,7.85), reflecting a neutral disposition (Table 3). Nearly half misattributed hyperactivity to sugar intake, and 43% endorsed punitive classroom responses, indicating enduring misconceptions about ADHD causation and management.

***Post-intervention outcomes***

Following completion of the SIM, both knowledge and attitude improved significantly. The mean post-test knowledge score rose to 16.27 (SD,2.08, t=24.63, p<0.001) (Table 2). The largest gain occurred in "management and teacher-role" content, indicating successful translation of theoretical understanding to practical competence (Table 4).

Similarly, attitude scores significantly increased from (M±SD, 61.72±7.85 to 81.64±6.93, t=20.17, p<0.001) (Table 3). After the intervention, more than three fourth (79.8%) of the participants displayed positive attitudes in empathy, tolerance, and classroom-management confidence, demonstrating parallel cognitive–affective improvement (Table 4).

**Table 4: Aspect-wise gain in knowledge and attitude scores (n=203).**

| Aspect | Pre-test Mean±SD | Post-test Mean±SD | Mean gain | % Increase |
|---|---|---|---|---|
| **Definition and features** | 2.91±0.64 | 4.52±0.53 | 1.61 | 55.3 |
| **Etiology and risk factors** | 1.48±0.72 | 3.79±0.64 | 2.31 | 156.1 |
| **Diagnosis and assessment** | 1.69±0.58 | 3.42±0.51 | 1.73 | 102.4 |
| **Management and teacher role** | 1.26±0.68 | 4.54±0.49 | 3.28 | 260.3 |
| **Overall knowledge index** | 9.84±2.31 | 16.27±2.08 | 6.43 | 65.3 |
| **Overall attitude index** | 61.72±7.85 | 81.64±6.93 | 19.92 | 32.3 |

SD = Standard Deviation

**Table 5: Correlation between knowledge and attitude scores (pre- and post-intervention).**

| Stage | Pearson's r | P value | Interpretation |
|---|---|---|---|
| **Pre-test** | 0.46 | <0.001*** | Moderate positive relationship |
| **Post-test** | 0.58 | <0.001*** | Strong positive relationship |

***P<0.001

***Knowledge-attitude relationship and predictors***

A moderate positive correlation between knowledge and attitude was observed at baseline (r=0.46, p<0.001), which strengthened post-intervention (r=0.58, p<0.001), confirming that cognitive acquisition was accompanied by attitudinal enhancement (Table 5).

A multiple linear regression (ANCOVA model) adjusting for baseline knowledge identified prior exposure to ADHD information (β=0.28, p<0.001) and parental education (β=0.19, p=0.004) as independent predictors of higher post-test knowledge. Gender and family type were non-significant covariates (Table 6). These findings suggest that educational background and informational access were key determinants of learning outcomes.

***Multicentric comparison***

A two-way mixed ANOVA with time (pre-test, post-test) as the within-subject factor and site as the between-subject factor revealed a significant main effect of time, $F=604.5$, $p<0.001$, $\eta^2_p=0.75$, confirming large overall learning gains following the Self-Instructional Module (SIM). The Time × Site interaction was nonsignificant, $F=1.12$, $p=0.33$, indicating that the magnitude of improvement did not differ significantly across the three centers. However, a baseline one-way ANOVA of pre-test knowledge scores showed modest site differences, $F=9.84$, $p<0.001$, with trainees in the urban college scoring slightly higher prior to the intervention. Post-test means converged across all centers (mean difference <0.3, $p=0.71$), confirming that the SIM was uniformly effective across urban and semi-rural educational contexts.

**Table 6: Predictors of post-test knowledge (ANCOVA) and site effects (two-way mixed ANOVA), (n=203).**

| Predictor variable | β coefficient | SE | t | P value |
|---|---|---|---|---|
| **Prior ADHD information** | 0.28 | 0.07 | 3.84 | <0.001*** |
| **Parental education** | 0.19 | 0.06 | 2.93 | 0.004** |
| **Gender** | 0.08 | 0.05 | 1.32 | 0.19 (NS) |
| **Type of family** | 0.06 | 0.04 | 1.08 | 0.28 (NS) |

Predictors (ANCOVA; adjusted for pre-test knowledge; β=standardized). Site effects (two-way mixed ANOVA) Time main effect: $F(1,200)=604.5$; $p<0.001$. Time×Site interaction: $F(2,200)=1.12$; $p=0.33$. Baseline site differences (pre-test one-way ANOVA): $F(2,200)=9.84$; $p<0.001$. SE=Standard error; **p<0.01; ***p<0.001; NS=not significant; $\eta^2_p$ =partial eta squared/

***Overall impact***

The normalized learning-gain index showed participants achieved 78% of the possible improvement, reflecting high educational impact. Effect sizes above 1.0 for both outcomes classify the SIM as "highly effective" by international educational-research benchmarks. Collectively, these results confirm that a structured, nurse-led Self-Instructional Module produced substantial and consistent cognitive and affective improvements among pre-service teacher trainees, equipping them to identify, manage, and support children with ADHD within inclusive classrooms (Tables 2-6).

## DISCUSSION

This multicentric evaluative study showed that the Self-Instructional Module (SIM) led to a statistically significant improvement in pre-service teacher trainees' knowledge and attitudes regarding ADHD. The results suggest that the intervention was meaningful, scalable, and adaptable to diverse teacher-training contexts.

At baseline, participants found to have a limited understanding of ADHD, especially in etiology and management, paralleling international evidence that teachers often misinterpret hyperactivity as deliberate misbehaviour and lack familiarity with evidence-based strategies.[11-19] Following exposure to the SIM, both cognitive and affective domains improved markedly (mean post-test knowledge =16.27±2.08; attitude =81.64±6.93), reflecting large, consistent effects comparable to similar quasi-experimental studies in Saudi Arabia, Turkey, and India.[17-21] These findings substantiate that brief, structured, nurse-facilitated self-learning can yield learning outcomes equivalent to longer, instructor-led workshops.

The most pronounced improvements occurred in "management and teacher-role" domains, confirming that the SIM successfully bridged theoretical awareness with classroom practice. Comparable trends were reported in Australia and South Africa, where focused teacher education improved confidence and reduced punitive responses.[28,29] The strengthened post-intervention correlation ($r=0.58$) supports the cognitive–affective model of professional learning, indicating that conceptual clarity fosters empathy and tolerance toward learners with ADHD. Regression analysis further identified prior ADHD exposure and parental education as predictors of learning gain, aligning with previous Indian findings linking socio-educational background to receptivity.[11, 27]

The multicentric design validated the SIM's uniform efficacy across urban and semi-rural contexts. This demonstrates the feasibility of embedding nurse-led educational models in pre-service teacher curricula. Nursing professionals, with their expertise in behavioural health and developmental counselling, are uniquely positioned to lead such interdisciplinary initiatives advancing the inclusive-education vision of the National Education Policy (NEP) 2020, Samagra Shiksha, and the UNESCO Teacher-Training Framework for Inclusive Education (2023).

At the classroom level, trainees acquired practical competencies for early identification, behavioral support, and referral coordination. Institutionally, the SIM's hybrid, low-cost format allows easy integration into existing D.Ed. curricula. At the policy level, adoption through District Institutes of Education and Training (DIETs) could standardize ADHD awareness and early-intervention readiness nationwide, reinforcing India's inclusive-education mandate.

This study contributes novel evidence in four areas: it targets pre-service teacher trainees, a population seldom studied; it operationalizes a nurse-led, self-instructional design; it demonstrates consistent multicentric effectiveness; and it records domain-specific cognitive and affective gains. Together, these advances highlight the importance of nurse-led innovation and interprofessional collaboration in child-mental-health education.

Major strengths include rigorous instrument validation (CVI=0.94), high reliability (r≥0.945), full participant retention, and a multicentric sample capturing socio-educational diversity. Integration of Google-Classroom analytics enhanced process fidelity and verified participant engagement. However, the absence of a control group limits causal inference, and the one-week follow-up precluded assessing knowledge retention. Self-reported attitude data may involve social-desirability bias, and findings from a single state require cautious generalization.

## CONCLUSION

This multicentric study provides robust evidence that the Self-Instructional Module is an effective, affordable, and scalable innovation for strengthening pre-service teacher trainees' ADHD-related knowledge and attitudes. By integrating structured content, reflection, and digital interactivity, the SIM effectively translated theoretical understanding into classroom-ready competence.

Nurses can play a transformative role as facilitators of interdisciplinary learning that bridges health and pedagogy. Embedding nurse-facilitated ADHD modules as micro-credentials within teacher-education curricula would advance India's inclusive-education and child-mental-health goals. Large-scale replication and longitudinal evaluation across multiple states will be essential to confirm sustainability and policy impact.

### *Recommendations*

Future studies should employ randomized or quasi-experimental designs with 3-6-month follow-up, incorporate classroom observations or simulation-based assessments, and evaluate cost-effectiveness and scalability using implementation-science frameworks. Collaborative research involving nursing educators, teacher-training boards, and mental-health professionals is recommended to facilitate nationwide policy translation.

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