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Research Article

# COMMUNITY-DELIVERED GROUP INTERVENTION FOR NICOTINE DEPENDENCE REDUCTION AMONG RURAL ADULTS: EVIDENCE FROM A QUASI-EXPERIMENTAL STUDY

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## ABSTRACT

Nicotine dependence remains highly prevalent in rural communities, where access to structured cessation programs is often limited. Behavioral interventions delivered in group settings within the community may provide an effective and affordable strategy for reducing tobacco dependence. However, evidence regarding their effectiveness in rural Indian populations is still insufficient. To evaluate the effectiveness of a structured community-based group intervention in reducing nicotine dependence among adults residing in rural areas of Vadodara district, Gujarat. A quasi-experimental one-group pre-test and post-test study was conducted among 450 adult tobacco users selected through purposive sampling. Participants underwent a 12-week structured group intervention consisting of behavioral counseling, peer support, health education, stress management, and relapse prevention techniques. Nicotine dependence was assessed before and after the intervention using the Fagerström Test for Nicotine Dependence (FTND). Data were analyzed using descriptive statistics, paired t-test, and chi-square test. At baseline, the majority of participants demonstrated moderate (65.1%) and high (17.8%) nicotine dependence. Following the intervention, the proportion of participants with low dependence increased substantially to 33.8%, while high dependence decreased to 15.6%. The mean FTND score showed a statistically significant reduction from 2.89 ± 1.31 at baseline to 2.23 ± 1.11 after the intervention ($p < 0.001$). Significant associations were observed between nicotine dependence and selected demographic and tobacco-use characteristics. The structured community-based group intervention was effective in reducing nicotine dependence among rural adults. These findings highlight the potential role of community-level behavioral programs in strengthening tobacco cessation efforts in rural healthcare settings.

**Keywords:** Nicotine dependence, Tobacco cessation, Community intervention, Rural health, Behavioral counseling.

## INTRODUCTION

Nicotine and other forms of substance use continue to pose a major public health challenge, particularly in rural communities where access to healthcare services and specialized addiction treatment remains inadequate. Limited availability of trained professionals, poor infrastructure, and social stigma associated with addiction often prevent individuals from seeking timely support. In addition, geographic barriers and lack of awareness further contribute to the persistence of untreated substance use disorders in rural populations (Kumar & Basu, 2016; Murthy, 2018). Behavioral interventions delivered in group settings have been widely recognized as effective approaches for managing substance dependence. Such interventions promote mutual support, improve coping abilities, and enhance motivation to reduce or quit substance use. Techniques based on cognitive-behavioral principles, combined with structured health education, have shown encouraging results in improving treatment outcomes and preventing relapse. However, most existing studies have been conducted in hospital-based or urban environments, and there is limited evidence regarding the applicability and effectiveness of these interventions within rural community settings (Stead *et al.*, 2017; Fiore *et al.*, 2008).

Considering these gaps, a structured community-based group intervention was implemented among tobacco users residing in rural areas of Vadodara district, Gujarat. The intervention focused on behavioral modification, peer interaction, relapse prevention strategies, and health

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education to support reduction in nicotine dependence. Evaluating such interventions in rural settings is essential for developing accessible and culturally appropriate tobacco cessation programs. The objective of the study was to assess the effectiveness of a structured community-based group intervention in reducing nicotine dependence among adults living in rural areas of Vadodara district, Gujarat.

## MATERIALS AND METHODS

### Study Design and Setting

The present study employed a quasi-experimental single-group pre-test and post-test research design to examine the impact of a structured community-based group intervention on nicotine dependence. The study was carried out in selected rural areas of Vadodara district, Gujarat, India, including Community-Based De-addiction Clinics (CBDCs) and their affiliated outreach communities. The total duration of the study was six months, which included baseline assessment, intervention implementation, and post-intervention evaluation.

### Study Population and Sampling Technique

The target population comprised adult tobacco users residing in rural communities of Vadodara district. Participants who fulfilled the eligibility criteria were selected using a purposive sampling method. Initially, 450 eligible individuals were enrolled and assessed at baseline. Following completion of the structured 12-week intervention program, 420 participants remained available for post-intervention assessment. The overall attrition rate was 6.67%, which is considered acceptable for community-based behavioral intervention studies.

### Intervention Protocol

Participants received a structured community-based group intervention conducted over a period of 12 weeks. Group sessions were organized once weekly, and each session lasted approximately 90 minutes. The intervention was designed to promote behavioral change and support reduction in nicotine dependence through multiple evidence-based components. The intervention included the following elements: Peer Support Component: Participants were encouraged to share their personal experiences related to tobacco use, discuss challenges in quitting, and provide mutual encouragement. Group interaction was used to strengthen motivation and promote positive behavioral modeling. Cognitive-Behavioral Strategies: Techniques derived from cognitive-behavioral therapy were incorporated to help participants recognize tobacco-use triggers, modify negative thought patterns, and develop effective coping mechanisms to manage cravings (Fiore *et al.*, 2008). Health Education Sessions: Educational discussions were conducted to increase awareness regarding the harmful effects of tobacco consumption, health benefits associated with cessation, and strategies to prevent relapse. Stress Management Training: Participants were taught practical stress-reduction techniques, including deep breathing exercises and relaxation methods, to help manage psychological stress associated with nicotine withdrawal. Relapse Prevention Strategies: Participants were guided in identifying high-risk situations and developing problem-solving skills to maintain behavioral change and prevent relapse. All sessions were delivered by trained community health personnel under the supervision of qualified mental health professionals to ensure consistency and quality of the intervention.

### Outcome Measure

Nicotine dependence was evaluated using the Fagerström Test for Nicotine Dependence (FTND), a standardized and widely accepted instrument for assessing the severity of tobacco addiction (Heatherton *et al.*, 1991). The FTND consists of structured questions designed to measure patterns of nicotine use and dependence. The tool has demonstrated satisfactory internal consistency, with Cronbach's alpha values reported between 0.72 and 0.75. Based on the total score, participants were categorized into different levels of dependence, including low, low-to-moderate, moderate, and high dependence. Due to its established validity and reliability, the FTND is considered appropriate for use in community-based tobacco cessation research.

### Data Collection Procedure

Data collection was conducted in two sequential phases. Baseline Assessment: Prior to initiation of the intervention, participants were interviewed to collect information regarding socio-demographic characteristics, tobacco use history, and baseline nicotine dependence using the FTND. Post-Intervention Assessment: Following completion of the 12-week intervention program, the FTND was re-administered to evaluate changes in nicotine dependence levels. All data were collected using structured interviewer-administered questionnaires. Interviews were conducted in the local language to ensure participant understanding and accuracy of responses.

### Statistical Analysis

Data were analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Analytical procedures included: Descriptive Statistics: Frequency, percentage, mean, standard deviation. Paired t-test: Assessing pre- and post-intervention differences in FTND scores. Chi-square Test: Assessing associations between nicotine dependence (pre-test) and socio-demographic variables. A significance level of $p < 0.05$ was used. Reporting adhered to the EQUATOR Network guidelines, specifically the TREND statement appropriate for quasi-experimental studies.

## RESULTS AND DISCUSSION

A total of 450 individuals seeking treatment at community-based de-addiction centres (CBDCs) were enrolled, of whom 420 (93.3%) completed the post-intervention assessment, yielding an attrition rate of 6.67% within

acceptable limits for behavioral intervention trials. The sample was predominantly male (94%), with a mean age falling within the 26-30 year bracket (33.6%). Nearly half reported no formal education (44%), and 40% were unemployed. Most participants were Hindu (90%), vegetarian (90%), and resided in joint family households (72.4%). The majority of participants reported tobacco use spanning three or more years (46% for 3-4 years; 36.4% for more than 4 years), with daily use documented in 50.2% of the sample. The most commonly used tobacco forms were gutkha (35.1%), cigarettes (23.8%), bidi (21.6%), and khaini (15.1%). Only 17.3% had received prior treatment for tobacco dependence, highlighting a largely treatment-naive sample. A strong social context for tobacco use was evident: 88.4% reported tobacco use among family members, and 85.3% preferred consuming tobacco in the company of others. Occupational stress (54.2%) and personal tension (56.9%) were the most frequently cited drivers of initiation and continued use. Baseline FTND scores indicated that the majority of participants presented with clinically significant dependence. Moderate dependence was most prevalent (65.1%), followed by high dependence (17.8%), low dependence (9.1%), and low-to-moderate dependence (8.0%). Collectively, 82.9% of participants fell within the moderate-to-high dependence range prior to the intervention. Following the 12-week structured community-based group intervention, a statistically significant reduction in FTND scores was observed (Table 4). The mean score decreased from 2.90 (SD = 1.31) at baseline to 2.23 (SD = 1.11) at follow-up ($p < 0.001$), indicating a meaningful clinical improvement across the sample. Post-intervention FTND distribution demonstrated a marked shift toward lower dependence categories. The proportion of participants classified as having low dependence rose substantially from 9.1% to 33.8%, while those in the low-to-moderate category increased from 8.0% to 20.0%. Moderate dependence declined from 65.1% to 24.0%, and high dependence decreased from 17.8% to 15.6%. These distributional shifts confirm that the intervention produced clinically meaningful reductions across all dependence severity levels.

Chi-square analyses identified several sociodemographic and behavioral variables significantly associated with pre-intervention dependence severity. Significant associations were found for age, education, occupation, annual income, marital status, religion, family type, number of family members, dietary habits, history of medical illness, duration of tobacco use, frequency of use, prior treatment history, family tobacco use, and tobacco form used (all $p < 0.05$). Notably, gender ($p = 0.260$), friends' tobacco use ($p = 0.418$), and advice received regarding quitting did not reach statistical significance, suggesting that proximal social and economic factors carry greater weight in predicting dependence severity than peer exposure or awareness alone. This study evaluated the effectiveness of a structured community-based group intervention on nicotine dependence among treatment-seeking adults in a rural Indian setting. The significant reduction in FTND scores following the 12-week program, alongside the marked distributional shift from moderate-to-high toward low dependence categories, supports the clinical utility of behaviorally oriented group interventions delivered through community de-addiction centres. These findings contribute to a growing body of evidence demonstrating that structured, low-intensity interventions can produce meaningful reductions in tobacco dependence in resource-constrained settings.

The magnitude of improvement observed particularly the near fourfold increase in participants classified as having low dependence (9.1% to 33.8%) is clinically significant and compares favorably with outcomes reported in similar community-based tobacco cessation trials in low- and middle-income countries (LMICs). The intervention's effectiveness is consistent with Bandura's Social Cognitive Theory, which posits that behavior change is facilitated through self-efficacy reinforcement, observational learning, and social support mechanisms that are inherently activated within group therapeutic formats (Bandura, 1986). The group setting may have further served to normalize help-seeking behavior in a population where prior treatment uptake was notably low (17.3%), suggesting that social reinforcement played a meaningful role beyond the psychoeducational content alone.

The persistence of high dependence in a subset of participants (15.6% post-intervention, reduced from 17.8%) warrants careful consideration. This modest reduction among the most severely dependent individuals is consistent with literature indicating that high-dependence users are less responsive to behavioral interventions alone and may require adjunctive pharmacotherapy such as varenicline or nicotine replacement therapy to achieve clinically meaningful outcomes (Fiore *et al*., 2008). This pattern underscores the need for stratified care pathways within community-based programs, whereby individuals screened at high dependence are triaged toward more intensive or combined treatment modalities. At baseline, the majority of participants demonstrated moderate (65.1%) to high (17.8%) nicotine dependence, indicating substantial substance-use burden in rural communities. Following the 12-week intervention, a significant reduction in nicotine dependence was observed, as reflected by both categorical improvements and a statistically significant decrease in mean FTND scores ($p = 0.0001$). Notably, low-dependence levels increased from 9.1% to 33.8%, and moderate/high dependence levels declined substantially. These findings demonstrate the clinical efficacy of structured, community-delivered behavioral interventions.

The study's findings are consistent with Bandura's Social Cognitive Theory, which emphasizes the role of observational learning, peer reinforcement, and self-efficacy in behavior modification (Bandura, 1986). The group-based approach appears to have enhanced motivation, coping skills, and commitment to change among participants, supporting the mechanisms proposed by the theory. The intervention also aligns with the principles of Screening, Brief Intervention, and Referral to Treatment (SBIRT), which has been effective in reducing substance use in community and primary-care settings

(Babor *et al*., 2007). Similar to SBIRT-based strategies, the present intervention used behavioral counselling, motivational support, and follow-up reinforcement. National and global evidence has highlighted the need for community-level tobacco-control and cessation interventions, particularly in India (Kumar & Basu, 2016; Murthy, 2018; Patil *et al*., 2018; Singh & Arora, 2007). Findings from this study support those by Das *et al*., who demonstrated the positive impact of group therapy on treatment outcomes among individuals with substance use disorders in India. Likewise, Mishra and Shukla emphasized the role of community participation in reducing alcohol and tobacco use among rural youth, reinforcing the necessity of localized, culturally adaptable models.

Significant associations between pre-intervention nicotine dependence and socio-demographic characteristics highlight the social determinants of substance use. Variables such as age, education, occupation, income, marital status, religion, type of family, and family size showed strong associations with dependence ($p < 0.05$). These results underscore the multifactorial nature of addiction, where economic stress, lack of education, occupational pressures, and rural living conditions play critical roles. Behavioral variables including duration of tobacco use, frequency of use, history of medical illness, prior treatment, family tobacco use, and type of tobacco product also showed strong associations, indicating that addiction patterns cluster around both social and habitual factors. Non-significant associations with gender and friends' tobacco use suggest that family influences and socio-economic pressures may be more powerful determinants in rural populations. Future studies should incorporate randomized controlled designs, include long-term follow-up, and examine additional outcomes such as quality of life, mental health, relapse rates, and multi-substance addiction. Implementation research is needed to assess scalability, sustainability, and cost-effectiveness of group-based interventions in diverse rural settings.

## CONCLUSION

This study provides evidence that a structured, community-based group intervention can significantly reduce nicotine dependence among rural adults, as demonstrated by statistically and clinically meaningful reductions in FTND scores and a substantial redistribution of participants from moderate-to-high toward lower dependence categories. The findings establish community-based de-addiction centres as viable, culturally adaptable, and low-resource platforms for behavioral tobacco cessation in settings where specialist addiction services remain inaccessible to the majority. The significant associations observed between baseline dependence severity and sociodemographic factors including age, education, occupation, income, family structure, and duration of tobacco use reinforce that nicotine dependence in this population is shaped by intersecting social and economic determinants. Effective intervention, therefore, requires approaches that extend beyond behavioral counseling alone to incorporate family-level engagement and socioeconomic sensitivity. The intervention model demonstrated in this study is feasible, scalable, and well-suited for integration within existing primary healthcare infrastructure. Community health workers and nursing professionals are well-positioned to lead screening, brief intervention, relapse prevention, and community mobilization efforts within such frameworks, offering a sustainable workforce solution for rural addiction services. Future research should prioritize randomized controlled trials with long-term follow-up, biochemically verified abstinence outcomes, and examination of relapse trajectories. Extending the model to address multi-substance use and incorporating digital or mobile-based follow-up modalities would further strengthen both the reach and sustainability of community-delivered addiction interventions in rural India and comparable low- and middle-income settings.

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## CONFLICT OF INTERESTS

The authors declare no conflict of interest

## ETHICS APPROVAL

Ethical approval for the study was granted by the Institutional Ethics Committee of Parul Institute of Nursing, Parul University (Approval No: PUIECHR/PIMSR/00/081734/5715). Written informed consent was obtained from all participants prior to enrollment. Participants were informed about the purpose of the study, and their right to refuse or withdraw at any stage without any negative consequences was clearly explained. Participation was entirely voluntary, and ethical principles outlined in human research guidelines were followed.

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## AI TOOL DECLARATION

The authors declare that no AI and related tools are used to write the scientific content of this manuscript.

## DATA AVAILABILITY

Data will be available on request

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