RESEARCH PAPER

Translation, Cultural Adaptation and Psychometric analysis of the Cigarette Dependency Scale-12 (CDS-12) for Hindi proficient Population

[1]Aditi and [2]*Professor (Dr.) Richa H. Rai

[1]PhD Scholar, School of Physiotherapy, Delhi Pharmaceutical Sciences and Research University, New Delhi, India
[2]Professor, School of Physiotherapy, Delhi Pharmaceutical Sciences and Research University, New Delhi, India
*[1]aditii.drama@gmail.com and [2]*profdrricharai@gmail.com*
*Corresponding Author: [2]*profdrricharai@gmail.com*

Received: 28th Feb, 2026; Revised: 6th March 2026; Accepted: 7th April, 2026; Available Online: 20th April, 2026

ABSTRACT

Background: Nicotine dependence is a significant public health concern in India, where tobacco use is prevalent across both rural and urban populations. The Cigarette Dependency Scale-12 (CDS-12) is a validated instrument widely used to assess nicotine dependence; however, no culturally adapted Hindi version currently exists to serve India's large Hindi-speaking population.

Objective: To translate, culturally adapt, and evaluate the content validity of the CDS-12 for Hindi-understanding individuals in India.

Methods: The study followed a standardized six-phase methodology for cross-cultural adaptation: (1) equivalence setting through cognitive interviews and focus groups, (2) forward translation by informed and uninformed translators, (3) blind backward translation, (4) expert panel review, (5) cognitive debriefing with 37 Hindi-speaking smokers, and (6) proofreading. Content validity was assessed using a panel of seven bilingual experts. The Item-level Content Validity Index (I-CVI), Scale-level CVI/Average (S-CVI/Ave), and Scale-level CVI/Universal Agreement (S-CVI/UA) were calculated. A cross-sectional survey was conducted with 196 smokers from urban and rural areas of Delhi NCR to evaluate demographic associations with nicotine dependency scores.

Results: The Hindi CDS-12 demonstrated excellent content validity, with 11 out of 12 items achieving an I-CVI of 1.00 and one item scoring 0.71. The S-CVI/Ave was 0.976 and S-CVI/UA was 0.916, indicating strong scale-level agreement. Demographic analysis revealed higher dependency scores among younger, never-married participants and those without children, although parental status showed a statistically significant inverse association with dependency ($p = 0.0482$). Education was not significantly associated with dependency levels.

Conclusion: The Hindi version of the CDS-12 is a culturally appropriate and content-valid tool for assessing nicotine dependence in Hindi-speaking populations. It provides a valuable instrument for clinicians and researchers working in tobacco cessation and public health interventions across diverse Indian contexts.

Keywords: *Cigarette Dependency Scale-12 (CDS-12), Hindi translation, nicotine dependence, content validity, tobacco use, India, psychometric validation*

How to cite this article: Aditi, Rai RH. Translation, Cultural Adaptation and Psychometric analysis of the Cigarette Dependency Scale-12 (CDS-12) for Hindi proficient Population. Int J Drug Deliv Technol. 2026;16(39s): 208-219. DOI: 10.25258/ijddt.16.39s.24

Source of support: Nil.

Conflict of interest: None

BACKGROUND

Nicotine dependence remains a critical global health issue, contributing significantly to morbidity and mortality worldwide. According to the World Health Organization (WHO), tobacco use is one of the primary preventable causes of death, with an estimated 8 million deaths per year attributable to tobacco-related diseases.[1] In India, tobacco use poses an even more significant burden, with approximately 267 million individuals, or 29% of the adult population, engaging in some form of tobacco use, as reported by the Global Adult Tobacco Survey.[2] Cigarette dependence in India is a particular concern due to the high prevalence of smoking and associated health impacts, emphasizing the need for effective measurement tools tailored to the Hindi-speaking population. The prevalence of cigarette smoking in India is a significant public health concern, influenced by various cultural and demographic factors. The Global Adult Tobacco Survey (GATS) India 2016-17, conducted by the Ministry of Health and Family Welfare, provides comprehensive data on tobacco use in India. According to the survey the overall prevalence of smoking among adults (15 years and older) is 10.7%. The prevalence among men is significantly higher at 19.0%, while it is 2.0% among women. The NFHS-5 provides additional data on tobacco use, including smoking and found that 10.0% of men and 1.4% of women aged 15-49 smoke cigarettes. A study conducted by Joshi et al., in 2022 observed that 93% males were consuming cigarette

**Author for Correspondence: profdrricharai@gmail.com*

and only 7% females were smokers, out of 100 enrolled subjects while the ratio of bidi consumption was 75% for males and 24.3% in case of females, out of 107 subjects in Jodhpur, India.[3] While another study in the same year done in the departments of respiratory allergy and applied immunology and respiratory medicine, Vallabhbhai Patel chest institute, University of Delhi confirmed that a total of 4493 subjects seen in the TCC, 4370 (97.3%) were males and 2704 (60.2%) subjects were smokers while females were only 2.7% between the age of 31 to 40 years.[4]

The Cigarette Dependency Scale-12 (CDS-12) is a validated and widely used instrument for assessing nicotine dependence, initially developed in English to facilitate reliable assessments of dependency levels.[5] The item scores of the CDS-12 are recoded and aggregated on a level of dependence scale that ranges from 12 (lowest) to 60 (highest). The CDS includes a range of variables thought to be associated with cigarette dependence and produces a score indicating the level of individual dependence.[6] The original version of the SCQ was developed with three goals in mind: (a) to measure the subjective expected utility (SEU) of smoking expectancies, (b) to discover the principal dimensions of smoking expectancies, and (c) to examine the relation between smoking expectancies and degree of smoking.[7] The SEU is the cross product of the self-reported likelihood and the self-reported desirability of any given.[8-9]

India's large Hindi-speaking population represents a significant demographic within the country's tobacco-using population. However, limited access to validated Hindi-language versions of standard nicotine dependence assessments has hindered public health efforts to address tobacco addiction within this group. The absence of reliable, culturally tailored tools like a Hindi version of the CDS-12 may limit health professionals' ability to accurately assess dependency levels and develop effective, culturally relevant cessation programs.[10] However, language barriers and cultural differences can impact the accuracy and relevance of self-reported measures of dependency. Research has shown that culturally adapting and translating psychometric scales enhances both the validity and reliability of assessments in diverse populations.[11] The Iranian version of the Smoking Consequences Questionnaire demonstrated the average age of participants was approximately 40years including 376 male and 24 female, strong internal consistency (Cronbach's Alpha) and test-retest reliability (psychometric properties), confirming its validity for the target population.[12]

Direct application in non-English-speaking populations may compromise both linguistic accuracy and cultural relevance, potentially limiting effectiveness and interpretability of CDS-12. Studies have shown that culturally and linguistically adapted assessment tools not only enhance the reliability of self-reported data but also facilitate a deeper connection with respondents, enabling more accurate representation of their dependency levels.[11;13] Translation and cultural adaptation of the CDS-12 for Hindi-speaking populations are necessary steps to improve accessibility and ensure precise measurement in India's substantial Hindi-speaking demographic. This process includes linguistic translation, cultural modification, and psychometric validation to ensure that the instrument maintains its original psychometric properties while remaining culturally relevant.[13] Thus, the current study aims to address the need for a validated Hindi version of the CDS-12 to facilitate accurate assessment of cigarette dependence in this population, ultimately supporting public health initiatives to address and mitigate the tobacco burden in India.

Translation studies on smoking questionnaires focus on adapting and validating instruments used to assess tobacco use and its effects across different languages and cultures. This process is crucial for ensuring that research findings are applicable to diverse populations. The studies highlight various methodologies and outcomes related to the translation and validation of smoking-related questionnaires. The current study aims to contribute to the growing body of literature on culturally adapted tobacco dependence assessment tools by providing a rigorously translated and validated Hindi version of the CDS-12. Such tools are essential for developing targeted public health strategies and clinical interventions to combat tobacco dependency in India's diverse population, ultimately supporting the global goal of reducing the health burden associated with tobacco use. Moreover, by assessing dependence levels in rural and urban individuals and observing gender variations, the study provides preliminary epidemiological insights into smoking behaviour across diverse socio-demographic segments in the outskirts of Delhi NCR. The validated scale will serve as an essential tool for researchers, clinicians, and public health practitioners to assess cigarette dependence and design culturally relevant cessation programs in the Indian context.

METHODOLOGY

Participants and Setting

A total of 196 smokers ranging between 17 and 85 years (182 males and 14 females) were found and recruited from both rural and urban outskirts of the Delhi NCR region from July 2022 to December 2022 after translation and content validation of the questionnaire. Participants gave informed consent, and ethical protocols were followed. The sample size was calculated using Epi Info 7.2.6.0 software.

Study Design and Phases

Mixed-Methods, Instrumental, Cross-Sectional Validation study followed a systematic six-phase process as per Beatons Guideline (2000) to ensure the accurate translation and cultural adaptation of the Cigarette Dependency Scale-12 (CDS-12) into Hindi.[11] The process was designed in alignment with international best practices for cross-cultural scale adaptation. After the content validation, a survey study was conducted on 196 subjects.

Equivalence Setting:

Preliminary work involved a scoping literature review, cognitive interviews with four healthcare professionals, and two focus group discussions with smokers to ensure conceptual, item, and semantic equivalence between the original English version and the Hindi translation.

Forward Translation:
Two experienced translators independently translated the CDS-12 into Hindi—one familiar with the health field (informed) and the other not (uninformed). The two versions were then synthesized into a single forward translation.

Backward Translation:
Two new bilingual experts independently translated the synthesized Hindi version back into English (blind to the original). These translations were merged into a reconciled backward translation to compare with the original scale for discrepancies.

Expert Panel Review:
A panel of experts from the POS team reviewed the backward-translated version. Cultural, linguistic, and conceptual alignment were scrutinized, and necessary modifications were incorporated.

Cognitive Debriefing:
The pre-final version was tested through in-depth interviews with 37 Hindi-speaking smokers from diverse demographic backgrounds. Their feedback helped refine language clarity and cultural relevance.

Proofreading and Finalization:
The final Hindi version was proofread for accuracy and consistency before implementation.

Content Validation

The content validation of the Hindi version of the Cigarette Dependency Scale-12 (CDS-12) was performed using a structured, evidence-based approach as recommended by Yusoff (2019), incorporating six essential steps to ensure the relevance and representativeness of the translated tool for the target population. The following are the six steps of content validation: (a) Preparing content validation; (b) Selecting a review panel of experts; (c) Conducting content validation ;(d) Reviewing domain and items; (e) Providing score on each item and (f) Calculating CVI.

I. **Preparing Content Validation**: A structured form was developed including the definition of nicotine dependence, all 12 translated items, and a 4-point relevance scale (1 = not relevant to 4 = highly relevant), along with clear instructions for expert raters.

II. **Selecting a review panel of experts**: Seven bilingual experts with backgrounds in tobacco control, behavioural science, and psychometrics were purposively selected. The panel size aligns with recommendations for optimal content validity assessment (6–10 experts).

III. **Conducting content validation**: Experts received the form electronically and independently rated each item, ensuring unbiased assessment through a non-face-to-face approach.

IV. **Reviewing domain and items**: Experts reviewed the domain and each item's alignment with the construct of nicotine dependence and provided qualitative feedback for refinement.

V. **Providing score on each item**: Experts rated all items on the 4-point scale based on relevance and cultural appropriateness in the Hindi context.

VI. **Calculating CVI**: Item-level CVI (I-CVI), scale-level CVI by average method (S-CVI/Ave), and universal agreement (S-CVI/UA) were computed.

RESULTS

The data was analysed using IBM SPSS version 20. The demographics were analysed using descriptive analysis and correlations were tested using Karl Pearson correlation.

Table1: Shows majority of participants were from rural areas (53.6%), while 46.4% belonged to urban settings. The sample was predominantly male (92.9%), with only 7.1% females. Most participants were young adults, with the highest proportion (33.7%) between 21–25 years. Only 11.7% were above 45 years. A significant majority (90.8%) used cigarettes, while a smaller group (9.2%) used bidis. 94.4% of the subjects were educated, with only 5.6% identified as uneducated.

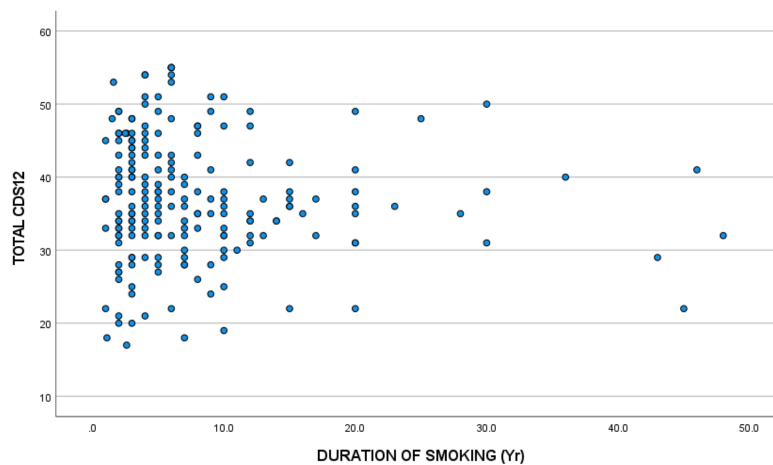
Variables	Frequency (Percent)
Address Distribution	
Rural	105 (53.6%)
Urban	91 (46.4%)
Gender Distribution	
Male	182 (92.9%)
Females	14 (7.1%)
Age Range	
15–20	38 (19.4%)
21-25	66 (33.7%)
26-30	33 (16.8%)
31-35	15 (7.7%)
36-40	15 (7.7%)
41-45	8 (4.1%)
46+	23 (11.7%)

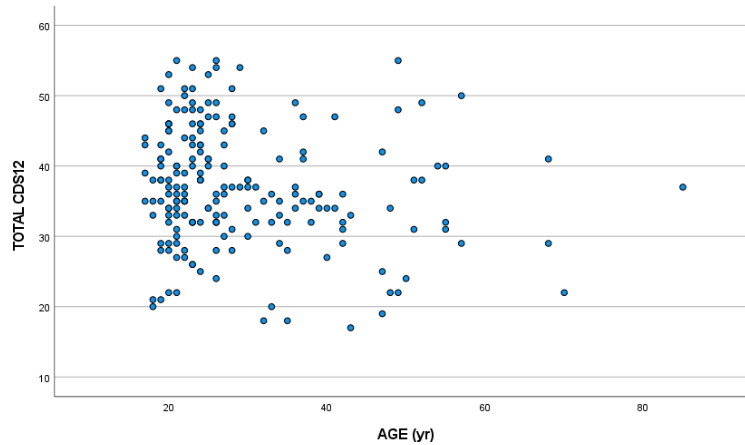
Cigarette/Bidi Use Cigarette Bidi	 178 (90.8%) 18 (9.2%)
Education Level Educated Uneducated	 185 (94.4%) 11 (5.6%)
Household structure Nuclear Non-nuclear	 87 (44.39%) 109 (55.61%)
Marital Status Never Married Ever Married	 109 (55.7%) 87 (44.3%)
Parental Status Having baby Not having baby	 59 (30.1%) 137 (69.9%)

Table2: Shows the mean age was 29.34 years (range 17–85), indicating a relatively young population. The average value (1.07) reflects male dominance (coded as 1). Mean value (1.46) suggests a near-even rural-urban distribution. The average BMI was 22.86, which lies in the normal weight range. Participants had been smoking for an average of 8.12 years. The mean pack-year score was 6.92, indicating varying levels of cumulative tobacco exposure.

Variable	N	Min	Max	Mean	Std. Dev	Std. Error
Age (years)	196	17	85	29.34	11.707	0.836
Address (1=R/2=U)	196	1	2	1.46	0.500	0.036
Gender (1=M/2=F)	196	1	2	1.07	0.258	0.018
BMI	196	26.4	37	22.86	4.192	0.299
Duration Smoking (yr)	196	1	48	8.12	8.272	0.591
Pack Year	196	0	46	6.92	8.099	0.578

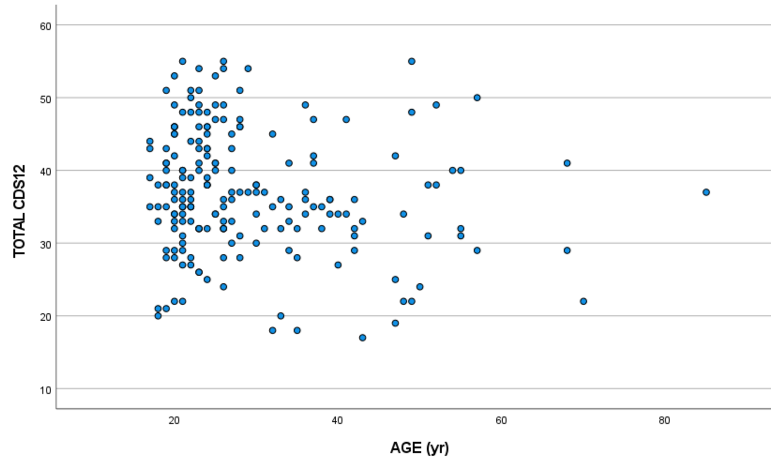
Demographic Profile





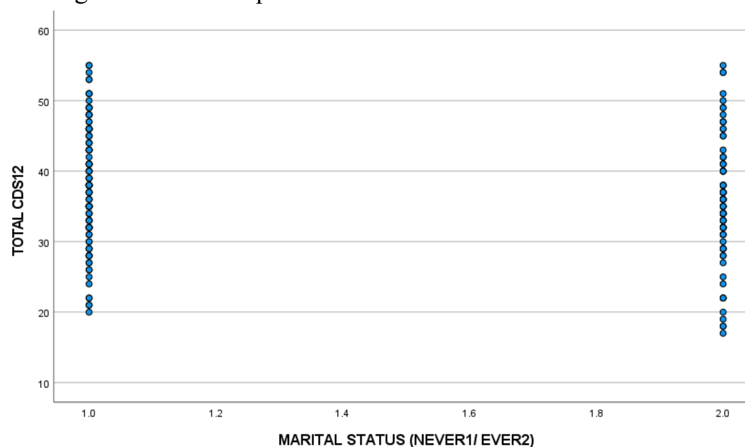
A total of 196 participants were included in the study, with a pronounced gender imbalance: 182 males (92.9%) and 14 females (7.1%). The mean age of participants was 29 years, ranging from 17 to 85 years. The sample comprised individuals from both rural and urban areas on the outskirts of Delhi NCR, with the majority belonging to the Hindu community. Smoking duration averaged 8.11 years across the cohort, and the mean pack-year consumption was 6.96. Most participants preferred cigarettes over bidis, and "feeling relaxed" was the most frequently reported emotional state associated with smoking. The average CDS-12 score for nicotine dependency was 37.04.

Age and Dependency



Participants in the younger age bracket (15–25 years) reported comparatively higher CDS-12 scores, despite having smoked for a shorter duration. In contrast, older participants demonstrated longer smoking histories but slightly lower dependency scores. This pattern suggests an inverse relationship between age and current perceived nicotine dependence, potentially reflecting changes in smoking patterns, nicotine tolerance, or motivational factors across life stages.

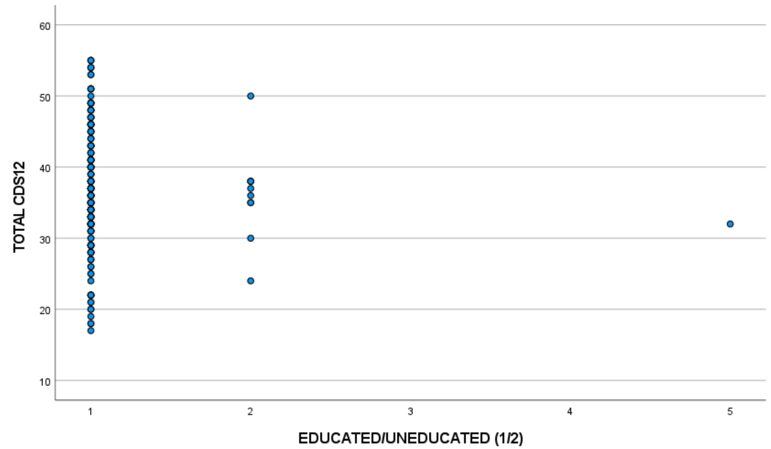
Marital Status and Dependency



A Karl Pearson correlation analysis was conducted to examine the relationship between marital status and nicotine dependence, as measured by the total CDS-12 score. The results revealed a statistically significant

negative correlation between marital status and CDS-12 scores (r = -0.141, p = 0.049), indicating that marital status has a weak inverse association with cigarette dependence levels. Specifically, participants who were never married (coded as 1) tended to report higher nicotine dependency compared to those who were ever married (coded as 2). Although the strength of the correlation is modest, the statistical significance at the 0.05 level with 0.049 suggests that marital status may be a meaningful factor in smoking behaviour, potentially due to differing psychosocial stressors, support systems, or lifestyle structures between married and unmarried individuals. These findings support the inclusion of marital status as a relevant sociodemographic variable in future smoking cessation research and intervention planning.

Education and Dependency



Out of the total sample, 185 participants (94.4%) were classified as educated, and 10 (5.1%) as uneducated. The mean CDS-12 score was 37.10 for educated individuals and 36.10 for uneducated ones. The correlation coefficient between education status and dependency score was -0.0261, revealing an almost negligible relationship. Furthermore, the difference was statistically non-significant (p = 0.7164), and the effect size (Cohen's d = 0.12) was minimal, suggesting that educational background may not be a key determinant of cigarette dependency in this cohort.

Parental Status and Dependency

Among the respondents, 59 participants (30.1%) reported having children, while 137 (69.9%) did not. Interestingly, participants without children exhibited higher mean dependency scores (37.82) compared to those with children (35.24), despite the latter group having a longer average smoking duration (13.6 years vs. 5.8 years) and greater pack-year consumption (11.5 vs. 4.1). A weak positive correlation (r = 0.1413) was found between having children and CDS-12 scores. The difference was statistically significant (p = 0.0482), though the effect size was moderate (Cohen's d = -0.31). However, this finding is likely influenced by a confounding age effect, as the average age of participants with children (41.7 years) was substantially higher than those without (24.0 years), suggesting that life-stage factors may play a more prominent role than parental status alone.

Table 3: Frequencies and percentages of participant responses to each item of the Hindi-translated Cigarette Dependency Scale-12 (CDS-12), assessing perceived dependence, smoking behavior, and psychological urges among smokers (N = 196).

कृपया सिगरेट की अपनी लत को 0 से 100 के पैमाने पर रेट करें	Frequency (Percent)

0-20 = 1	21 (10.7%)
21-40 = 2	34 (17.3%)
41-60 = 3	32 (16.3%)
61-80 = 4	66 (33.6%)
81-100 = 5	43 (21.9%)
आप प्रतिदिन औसतन कितनी सिगरेट पीते हैं? ____ सिगरेट / प्रतिदिन	
1	50 (25.5%)
2	45 (22.9%)
3	31(15.8%)
4	33 (16.8%)
5	37 (18.8%)
सामान्यतः आप जागने के कितनी nsj ckn अपनी पहली सिगरेट पीते हैं? ____मिनट	
1	11 (5.6%)
2	35 (17.8%)
3	20 (10.2%)
4	57 (29.08%)
5	73 (37.2%)
आपको अपनी भलाई के वलए धम्रपान छोडना होगा:	
1	15 (7.6%)
2	26 (13.2%)
3	68 (34.6%)
4	34 (17.3%)
5	53 (27.04%)
धूम्रपान के बिना कुछ घंटों के बाद, मुझे धूम्रपान करने के लिए न रोकी जा सकनेवाली तलब महसूस होती है	
1	25 (12.7%)
2	21 (10.7%)
3	57 (29.08%)
4	57 (29.08%)
5	36 (18.3%)
सिगरेट न होने का विचार मेरे तनाव का कारण बनता है	
1	27 (13.7%)
2	31 (15.8%)
3	47 (23.9%)
4	53 (27.0%)
5	38 (19.3%)
बाहर जाने से पहले, मैं हमेशा सुनिश्चित करता हूँ कि मेरे पास सिगरेट है	
1	26 (13.2%)
2	31 (15.8%)
3	38 (19.4%)
4	55 (28.06%)
5	46 (23.4%)
मैं सिगरेट का v/khu हूँ	
1	17 (8.6%)
2	33 (16.8%)
3	37 (18.8%)
4	42 (21.4%)
5	67 (34.1%)
मैं बहुत अधिक धूम्रपान करता हूँ पूरी तरह से असहमत	
1	19 (9.7%)

2	24 (12.2%)
3	45 (22.9%)
4	51 (26.02%)
5	57 (29.08%)
कभी-कभी मैं बाहर tkdj सिगरेट खरीदने के लिए सब कुछ छोड़ देता हूँ	
1	44 (22.4%)
2	34 (17.3%)
3	44 (22.4%)
4	45 (22.9%)
5	29 (14.7%)
मैं हर समय धूम्रपान करता हूँ	
1	38 (19.3%)
2	23 (11.7%)
3	47 (23.9%)
4	44 (22.4%)
5	44 (22.4%)
eSa vius LokLF; ij flxjsV ls gksus okyh gkfu dks le>rs gq, Hkh धूम्रपान करता हूँ	
1	14 (7.1%)
2	17 (8.6%)
3	34 (17.3%)
4	37(18.8%)
5	94 (47.9%)

Table4: Shows the relevance ratings for content validation on the item scale taken by seven experts.

Item number	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Experts in agreement	I-CVI (agreed item)/ (number of expert)
1	1	1	1	1	1	1	1	7	1
2	1	1	1	1	1	1	1	7	1
3	1	1	1	1	1	1	1	7	1
4	1	1	1	1	1	1	1	7	1
5	1	1	1	1	1	1	1	7	1
6	1	1	1	1	1	1	1	7	1
7	1	1	1	1	1	1	1	7	1
8	1	1	1	1	1	1	1	7	1
9	1	1	1	1	1	1	1	7	1
10	1	1	0	1	1	0	1	5	0.71
11	1	1	1	1	1	1	1	7	1
12	1	1	1	1	1	1	1	7	1

Content Validation Analysis and Results

Content validation was conducted by a panel of **seven subject-matter experts**, following the six-step procedure. Each expert independently assessed the relevance of the 12 translated items of the Cigarette Dependency Scale-12 (CDS-12) using a 4-point relevance scale.

Item-Level Content Validity Index (I-CVI)

The I-CVI was computed as the proportion of experts rating each item as either 3 (quite relevant) or 4 (highly relevant). Of the 12 items:

- 11 items (Items 1–9 and 11–12) achieved I-CVI = 1.00, indicating unanimous agreement on relevance.
- Item 10 received an I-CVI of 0.71, falling below the recommended cut-off of 0.83 for a 7-expert panel (Lynn, 1986).

This indicates that Item 10 may require revision for improved clarity or conceptual alignment.

Scale-Level Content Validity Index (S-CVI)

Two types of scale-level indices were calculated:

- **S-CVI/Ave (Average method):**

S-CVI/Ave=Sum of I-CVI scoresTotal items=11(1.00)+0.7112=0.976S\text{-}CVI/Ave = \frac{\text{Sum of I-CVI scores}}{\text{Total items}} = \frac{11(1.00) + 0.71}{12}

= 0.976S-CVI/Ave=Total itemsSum of I-CVI scores =1211(1.00)+0.71=0.976

- **S-CVI/UA (Universal Agreement method):**

S-CVI/UA=Number of items with I-CVI = 1Total items=1112=0.916S\text{-}CVI/UA = \frac{\text{Number of items with I-CVI = 1}}{\text{Total items}} = \frac{11}{12} = 0.916S-CVI/UA=Total itemsNumber of items with I-CVI = 1 =1211=0.916

Both values exceed the recommended thresholds of **0.90 for S-CVI/Ave** and **0.80 for S-CVI/UA**, indicating excellent overall agreement and content validity of the scale.

Eleven items achieved perfect agreement (I-CVI = 1.00); one item (Item 10) scored below threshold (I-CVI = 0.71). The scale-level indices indicated excellent content validity (S-CVI/Ave = 0.976, S-CVI/UA = 0.916).

The content validity analysis confirms that the Hindi version of CDS-12 demonstrates excellent item- and scale-level validity, with only minor modification needed for one item. The high S-CVI values support the instrument's relevance, clarity, and cultural appropriateness for assessing nicotine dependence among Hindi-speaking populations.

Expert Feedback

Qualitative comments were reviewed to identify potential areas for improvement. Item 10 was highlighted by two experts as potentially ambiguous in its phrasing. Suggested revisions will be considered in subsequent iterations of the tool.

DISCUSSION

This study aimed to translate, culturally adapt, and evaluate the content validity of the Cigarette Dependency Scale-12 (CDS-12) for the Hindi-speaking population in India. The results demonstrate that the translated instrument exhibits strong content validity and is culturally appropriate for use in nicotine dependence assessment among Hindi-speaking smokers in urban and rural settings of Delhi NCR.

Content Validity and Scale Appropriateness

Content validation, conducted by a panel of seven experts, yielded excellent agreement on 11 of the 12 items, with item-level content validity indices (I-CVI) of 1.00. One item (Item 10) scored slightly below the recommended threshold (I-CVI = 0.71), indicating a need for minor linguistic or contextual refinement. The overall scale-level indices (S-CVI/Ave = 0.976, S-CVI/UA = 0.916) exceeded the standard minimum values suggested in the literature[14-15], confirming the scale's appropriateness for this population. These findings are consistent with international guidelines that advocate for rigorous cultural adaptation and content validation in cross-cultural psychometric research.[11;13]

Smoking Patterns and Age-Based Dependency

The study revealed that younger participants demonstrated slightly higher dependency scores despite shorter smoking histories. This observation is consistent with global findings suggesting that nicotine dependence can escalate rapidly during adolescence and early adulthood due to greater neurobiological sensitivity and psychosocial factors.[1;16] Conversely, older participants—despite longer smoking durations—reported lower current dependency levels, which may reflect self-regulation, decreased usage, or emerging health awareness in later life.[17]

Sociodemographic Correlates of Dependency

The present study identified a statistically significant negative correlation between marital status and nicotine dependency scores as measured by the CDS-12 ($r = -0.141$, $p = 0.049$), suggesting that individuals who were never married reported higher cigarette dependence compared to those who were ever married. Although the strength of the correlation was modest, its statistical significance underscores the potential role of marital status as a social determinant of smoking behaviour.

These findings align with a growing body of literature suggesting that marriage may serve as a protective factor against the initiation and persistence of smoking. Marriage provides not only emotional support but also increased social control, which may lead to healthier behaviours, including reduced tobacco use.[18] Partners in stable relationships often engage in mutual regulation of health-related behaviours, including encouraging smoking cessation or reducing cigarette consumption.

Longitudinal research also supports this association which found that individuals who were married or transitioned into marriage were more likely to reduce or quit smoking, whereas those who remained unmarried or experienced marital disruption had higher odds of continued tobacco use.[19] Similarly, another study emphasized that stable intimate relationships among young adults promote health consciousness, contributing to lower rates of smoking in this group.[20] Indian cohort study also reinforce this trend, noting significantly higher smoking rates among unmarried and divorced males compared to married males. These patterns are particularly relevant in the Indian socio-cultural context, where family expectations and spousal influence can strongly shape behavioral norms, including tobacco use.[21] Overall, the present study adds to the literature by confirming that marital status is inversely associated with cigarette dependency, and highlights the need to consider relationship status in designing targeted cessation programs, especially for younger, unmarried populations.

The relationship between educational status and nicotine dependence was minimal, with both educated and uneducated groups showing similar dependency levels. This finding diverges from some global studies that associate higher education with lower tobacco use, suggesting that in this regional population, educational attainment may not substantially influence smoking behaviour.[22] It may also reflect limited health literacy or

cultural normalisation of smoking regardless of education level.

Prevalence by Area of Residence and Religion

In the present study, the participant distribution across residential areas revealed that a significant proportion of smokers were from both urban and rural outskirts of Delhi NCR, with smoking behaviour and dependency scores appearing comparably high in both groups. Although rural participants historically have been underrepresented in tobacco cessation programs, this study's inclusion of a rural-urban mixed sample provides valuable insight into the diverse socio-demographic context of smoking in North India.

Findings from the study at the Vallabhbhai Patel Chest Institute reinforce this observation, reporting that 71.7% of tobacco users seeking cessation services were from urban areas, while 28.3% were from rural regions.[23] However, national data from the Global Adult Tobacco Survey (GATS) highlights that tobacco use is more prevalent in rural India—with 52% of rural men reported as tobacco users compared to 38% of urban men. This discrepancy suggests that while urban individuals may have better access to cessation services, the burden of smoking remains higher in rural populations, possibly due to cultural normalization of tobacco use, limited awareness, and lower health-seeking behavior.[2] This further strengthens the need to expand tobacco cessation infrastructure and awareness campaigns in rural India, especially in the outskirts where accessibility is limited.

In terms of religion, the majority of respondents in our study were Hindu, which aligns with the demographic distribution of the Delhi NCR region. This mirrors the pattern observed in the reference study, where 87.7% of tobacco users were Hindu, followed by 12% Muslim and 0.3% from other faiths. While the religious affiliation alone may not directly dictate tobacco use behaviour, cultural attitudes embedded within certain communities—such as the acceptability of smoking among males or community norms around bidi consumption—can influence initiation and continuation patterns. For instance, studies have shown that tobacco consumption is often normalized in Hindu and rural male populations, where its use is interwoven with daily life, stress coping, and peer influence.

It is also notable that religious minority groups such as Muslims may underreport smoking due to stigma or religious prohibitions, leading to lower representation in cessation programs and surveys. Additionally, religious and cultural festivals, fasting practices, or family traditions might moderate smoking frequency and patterns across different religious groups, an area that warrants deeper ethnographic research.

Implications for Public Health

The evidence suggests that smoking is not confined to one specific demographic—it transcends both urban and rural boundaries and cuts across religious affiliations. However, rural smokers and minority groups may be underserved in cessation outreach, underscoring the need for regionally customized interventions that consider both geographic and cultural nuances. Health education, counseling services, and nicotine replacement therapies should be decentralized and made accessible in rural health centers, primary care setups, and community-based outreach programs, particularly in Hindi-speaking belts.

Influence of Parental Responsibility

An unexpected but significant finding was that participants with children had lower CDS-12 scores compared to those without children, despite smoking for a longer duration and consuming more tobacco (pack-years). This counter-intuitive result could be explained by lifestyle shifts, increased health awareness, and social pressures associated with parenting, which may promote efforts to reduce smoking behaviour.[24] However, the substantial age difference between these groups suggests age may be a confounding variable. Therefore, the observed protective influence of parenthood on dependency should be interpreted cautiously and warrants further investigation with age-matched cohorts.

Implications for Practice and Research

The availability of a culturally validated Hindi version of the CDS-12 has important implications for both clinical practice and public health research. It provides a reliable tool for assessing nicotine dependence among Hindi-speaking populations, enabling more accurate diagnosis, individualised cessation strategies, and surveillance of smoking behaviours. This is particularly relevant in India, where tobacco-related morbidity is high, and linguistic barriers often limit access to standardized tools.[10]

Strengths and Limitations

A key strength of this study is the systematic translation and validation process grounded in internationally accepted methodologies. Additionally, the inclusion of a mixed rural–urban sample enhances generalizability within the Hindi-speaking demographic. However, limitations include a heavily male-dominated sample and small subgroups for marital and educational categories, which restrict broader inference. Moreover, the cross-sectional design precludes causal conclusions regarding the observed associations.

CONCLUSION

The Hindi-translated version of the CDS-12 demonstrates excellent content validity and cultural suitability for assessing cigarette dependence in Hindi-speaking populations. While minor refinements are needed for one item, the tool holds promise for use in clinical and research contexts. The findings also underscore important sociodemographic patterns in smoking behaviour, suggesting the need for targeted interventions that consider age, marital status, and parental responsibilities. Further construct validity and test–retest reliability are recommended in future studies in the Hindi proficient population.

Conflict of Interest

There was no conflict of interest.

Funding

No funding was provided for this study.

REFERENCES

1. World Health Organization (WHO). Tobacco. 2021. Available from: https://www.who.int/news-room/fact-sheets/detail/tobacco
2. Global Adult Tobacco Survey (GATS) India 2016-2017. Ministry of Health and Family Welfare, Government of India. 2017. Available from: https://ntcp.mohfw.gov.in/assets/document/GATS-2%20India.pdf
3. Joshi V, Joshi NK, Bajaj K. Tobacco use pattern, dependence, oral cancer awareness and health education needs among urban slum dwellers of Jodhpur city. International Journal of Preventive Medicine. 2022;13:14. https://doi.org/10.4103/ijpvm.ijpvm_69_20
4. Kumar R, Goel N, Kumar S, Kushwah AS, Vijayan VK. Epidemiological Profile of Tobacco Users at Tobacco Cessation Centre: An Indian Experience. *Indian J Chest Dis Allied Sci*. 2016;58(2):93–97.
5. Etter JF, Le Houezec J, Perneger TV. A self-administered questionnaire to measure cigarette dependence: The Cigarette Dependence Scale. *Neuropsychopharmacology*. 2003;28(2):359–370. https://doi.org/10.1038/sj.npp.1300034
6. Stavem K, Røgeberg OJ, Olsen JA, Boe J. Properties of the Cigarette Dependence Scale and the Fagerström Test of Nicotine Dependence in a representative sample of smokers in Norway. *Addiction*. 2008;103(9):1441–1449. doi: 10.1111/j.1360-0443.2008.02278.x
7. Brandon TH, Baker TB. The Smoking Consequences Questionnaire: The subjective expected utility of smoking in college students. *Psychological Assessment: A Journal of Consulting and Clinical Psychology*. 1991;3(3):484
8. Cepeda-Benito A, Reig Ferrer A. Smoking Consequences Questionnaire—Spanish. *Psychol Addict Behav*. 2000;14(3):219–230. https://doi.org/10.1037/0893-164X.14.3.219
9. Reig-Ferrer A, Cepeda-Benito A. Smoking expectancies in smokers and never smokers: an examination of the smoking Consequences Questionnaire-Spanish. *Addictive Behaviors*. 2007;32(7):1405–1415. doi: 10.1016/j.addbeh.2006.10.004
10. Dhumal G, Gupta PC, Pednekar MS, Gajalakshmi V. Quit history, intentions, and attempts among smokers in India: Findings from the Tobacco Control Policy (TCP) India Pilot Survey. *Asian Pac J Cancer Prev*. 2020;21(4):1087–1094. https://doi.org/10.31557/APJCP.2020.21.4.1087
11. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine*. 2000;25(24):3186–3191. https://doi.org/10.1097/00007632-200012150-00014
12. Zeidi IM, Saffari M, Chen H, Pakpour AH. Translation, reliability and validity of Iranian version of the Smoking Consequences Questionnaire (SCQ) among smokers. *Subst Use Misuse*. 2014;19(5):382–387. https://doi.org/10.3109/14659891.2013.833654
13. Wild D, Grove A, Martin M, Eremenco S, McElroy S, Verjee-Lorenz A, et al. Principles of good practice for the translation and cultural adaptation process for patient-reported outcomes (PRO) measures: Report of the ISPOR task force for translation and cultural adaptation. *Value Health*. 2005;8(2):94–104. https://doi.org/10.1111/j.1524-4733.2005.04054.x
14. Polit DF, Beck CT. The content validity index: Are you sure you know what's being reported? Critique and recommendations. *Res Nurs Health*. 2006;29(5):489–497. https://doi.org/10.1002/nur.20147
15. Lynn MR. Determination and quantification of content validity. *Nurs Res*. 1986;35(6):382–385. https://doi.org/10.1097/00006199-198611000-00017
16. Chen X, Stanton B, Gong J, Fang X. Personal social capital scale: An instrument for health and behavioral research. *Health Educ Res*. 2003;24(2):306–317. https://doi.org/10.1093/her/cyn020
17. Benowitz NL. Nicotine addiction. *N Engl J Med*. 2010;362(24):2295–2303. https://doi.org/10.1056/NEJMra0809890
18. Umberson D, Donnelly R, Pollitt AM. Marriage, social control, and health behavior: A life course perspective. *Soc Sci Med*. 2018;214:122–130. https://doi.org/10.1016/j.socscimed.2018.07.035
19. Ramsey MW, Chen-Sankey JC, Reese-Smith J, Choi K. Association between marital status and cigarette smoking: variation by race and ethnicity. *Prev Med*. 2019;119:48–51. doi:10.1016/j.ypmed.2018.12.010
20. Schneider D, Harknett K. What's to lose? Social disadvantage and the retreat from marriage. *RSF Russell Sage Found J Soc Sci*. 2019;5(4):112–131. https://doi.org/10.7758/RSF.2019.5.4.06
21. Gajalakshmi V, Peto R. Smoking in India: Relationship with education and marital status. *Int J Epidemiol*. 2020;49(2):600–609. https://doi.org/10.1093/ije/dyz287
22. Centers for Disease Control and Prevention (CDC). Current cigarette smoking among adults in the United States. 2017. Available from: https://www.cdc.gov/tobacco/data_statistics/fact_sheets/adult_data/cig_smoking/index.htm
23. Kumar R, Kumar M, Raj S, Rachna R, Mishra J, Dubey S, et al. Quitting tobacco through quitline services: impact in India. *Monaldi Archives for Chest*

Disease. 2024;95:2976. doi: 10.4081/monaldi.2024.297

24. Bottorff JL, Oliffe JL, Kalaw C, Carey J, Mroz L. Men's constructions of smoking in the context of women's tobacco reduction during pregnancy and postpartum. *Int J Mens Health*. 2010;9(2):102–120. https://doi.org/10.3149/jmh.0902.102