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Research Article

Prevalence of Dual Use Smoking and Nicotine Dependence Levels Among Adolescents and Adults in Community Settings

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ABSTRACT

Dual smoking behavior, the concurrent use of conventional cigarettes and e-cigarettes, is an increasing public health concern, especially among adolescents and adults in Indonesia. **Purpose:** This study aimed to explore the prevalence of dual smoking behavior and nicotine dependence levels among community-dwelling adolescents and adults. This methode used was descriptive quantitative study involved 100 respondents selected through purposive sampling in RW 01 Cisaranten Kidul and RW 03 Ujung Berung. Data were collected using a demographic questionnaire, the Fagerström Test for Nicotine Dependence (FTND) for conventional cigarettes, and the Electronic Cigarette Dependence Index (ECDI) for dual users. Analysis utilized descriptive statistics. This results showed most respondents were adults (90%). A total of 76% used only conventional cigarettes, while 24% were dual users. Nicotine dependence levels for conventional smoking were: low (26%), moderate (58%), and high (16%). Among dual users, 70.8% had no dependence on e-cigarettes, and 29.2% were mildly dependent. Dual use was present among community smokers, with most respondents demonstrating moderate dependence on nicotine from conventional cigarettes. Strengthened health promotion and early prevention strategies are needed to reduce addiction risk and dual-use patterns.

INTRODUCTION

Tobacco use remains one of the most significant public health challenges globally, responsible for over 8 million deaths annually according to the World Health Organization (WHO, 2021b). In Indonesia, smoking prevalence among males represents some of the highest rates worldwide, with tobacco

consumption continuing to increase, particularly among younger populations (Moeis et al., 2024a). The emergence and widespread adoption of electronic cigarettes (e-cigarettes) have fundamentally altered tobacco consumption patterns, introducing new behavioral phenomena such as dual use—the concurrent consumption of conventional cigarettes and electronic cigarettes simultaneously or in alternating patterns.

Dual use represents a particularly complex public health concern because users frequently perceive it as a harm reduction strategy, believing they are reducing overall tobacco exposure by substituting conventional cigarettes with electronic alternatives (Gould, 2023). However, empirical evidence demonstrates that dual users do not achieve the intended harm reduction outcome. Instead, they experience compounded exposure to nicotine and other harmful substances from both products, resulting in sustained or increased nicotine dependence while extending the duration of tobacco use (Coleman et al., 2022a). Research utilizing the Population Assessment of Tobacco and Health (PATH) Study demonstrates that approximately 55% of electronic cigarette users maintain concurrent conventional cigarette consumption, establishing a persistent pattern of dual use (Snell et al., 2019).

The impact on adolescents and young adults is particularly concerning. During adolescence, the prefrontal cortex continues its developmental trajectory until approximately age 25 years, making this age group especially vulnerable to the neurotoxic effects of nicotine (Moeis et al., 2024a). Nicotine exposure during this critical developmental period disrupts synaptic pruning and myelination processes, resulting in long-term cognitive deficits, impaired executive functioning, reduced working memory capacity, and increased susceptibility to substance use disorders (Placzek et al., 2009). Furthermore, nicotine's highly addictive properties create neurobiological changes in the reward pathway, making cessation significantly more difficult in individuals who initiate use during adolescence.

Indonesia presents a unique epidemiological context for dual use research. Indonesian youth encounter sophisticated marketing strategies promoting electronic cigarettes as modern, safer alternatives to conventional smoking, combined with aggressive social media campaigns leveraging attractive flavorings, sleek product designs, and carefully crafted messaging. These marketing approaches disproportionately target younger demographics while exploiting perceptions of reduced harm and social acceptability of electronic cigarettes (Moeis et al., 2024a). Simultaneously, conventional cigarette availability through informal retail channels including single-stick sales at extremely affordable price points ensures continued accessibility for adolescent consumers with limited purchasing power.

Despite the documented prevalence of dual use at the national level, localized epidemiological data in primary healthcare settings remain limited. Most existing Indonesian research focuses exclusively on school-based populations or employs broad national surveys without detailed assessment of nicotine dependence using validated instruments such as the Fagerström Test for Nicotine Dependence (FTND) (Moeis et al., 2024a). This knowledge gap hinders the development of targeted, evidence-based interventions appropriate for specific community contexts. Therefore, this study aimed to characterize the prevalence of dual use smoking behavior and quantify nicotine dependence levels among both adolescent and adult populations in community settings served by primary healthcare facilities.

METHOD

This descriptive quantitative study was conducted in two residential communities: RW 01 Cisaranten Kidul and RW 03 Ujung Berung, situated within the service area of

Ujung Berung and Riung Primary Healthcare Centers (Puskesmas) in Bandung, West Java, Indonesia. The study was approved by the ethics committee and conducted in accordance with the principles outlined in the Declaration of Helsinki.

The target population comprised all adolescents (aged 10-19 years) and adults (aged ≥20 years) residing in the designated communities. Participants were recruited using purposive sampling technique based on predetermined inclusion and exclusion criteria.

Inclusion criteria: (1) age 10 years or older; (2) active smoker reporting consumption of at least one cigarette daily during the preceding six months; (3) residency in either RW 01 Cisaranten Kidul or RW 03 Ujung Berung; (4) ability to communicate in Bahasa Indonesia; and (5) provision of written informed consent (or parental consent for minors).

Exclusion criteria: (1) severe mental health conditions (major depressive disorder, schizophrenia, or significant cognitive impairment); (2) active substance use disorder involving alcohol, illicit drugs, or other substances; (3) acute illness preventing participation; and (4) inability or unwillingness to complete assessments.

Sample size was determined at 100 respondents, which provided adequate statistical power for descriptive analysis of prevalence estimates and dependence characteristics (Reynolds et al., 2025). Recruitment continued until the predetermined sample size was achieved.

Data collection instruments: demographic questionnaire: A structured instrument captured respondent age, gender, educational attainment, employment status, household income level, residential history, and general health status.

Fagerström Test for Nicotine Dependence (FTND): This six-item validated instrument measures nicotine dependence severity among conventional cigarette smokers (Gould, 2023; Heatherton et al., 1991). Items assess time to first cigarette after waking, difficulty refraining from smoking in non-permitted areas, most difficult cigarette to refrain from, cigarettes per day, early morning smoking pattern intensity, and smoking frequency during illness. Total scores range from 0-10, with interpretation as: mild dependence (0-3), moderate dependence (4-6), and severe dependence (7-10). The FTND demonstrates excellent psychometric properties with Cronbach's alpha ranging from 0.61-0.72 across diverse populations.

Electronic Cigarette Dependence Index (ECDI): For respondents reporting electronic cigarette use, this five-item instrument measures electronic cigarette-specific dependence. Items assess subjective perception of product addiction, difficulty refraining from use, frequency of use, use during non-permitted times, and use when experiencing negative affect. Total scores range from 0-10, with categorization as: no dependence (0-2), mild dependence (3-5), and severe dependence (6-10) (Foulds et al., 2015).

Dual use classification: Respondents were classified into two groups: conventional cigarette-only users and dual users (concurrent use of conventional cigarettes and electronic cigarettes, defined as use of both products at least weekly during the past month).

Data collection procedure: Data collection was conducted between June and August 2025. Trained research assistants administered all instruments through face-to-face interviews at community health centers, participant residences, or other convenient locations within the study settings. The data collection process required approximately 30-40 minutes per respondent. All participants received standardized verbal explanations of study objectives, procedures, risks, and benefits. Informed consent was obtained prior to enrollment, with parental consent and participant assent obtained for minor participants.

Data analysis: descriptive statistical analysis was performed using statistical software. Categorical variables (gender, education

level, use pattern) were summarized using frequency distributions and percentages. Continuous variables (age, nicotine dependence scores) were described using means, standard deviations, and ranges. Stratified analysis examined differences in dependence profiles between adolescent and adult subgroups using mean comparisons. Results were presented in tabular format with accompanying narrative interpretation.

Ethical considerations: This study received institutional ethics approval from the Ethics Committee at Universitas Bhakti Kencana (Approval No. dated 15 May 2025). Research procedures adhered to all regulatory requirements for human subjects research, including informed consent, voluntary participation, confidentiality protection, and secure data management. All study materials were accessible to participants in their preferred language. Participants experienced no foreseeable harm from study participation; however, all respondents received standardized health education materials addressing smoking-related health risks and evidence-based cessation resources.

RESULTS

The study enrolled 100 respondents with complete data. Demographic characteristics are presented in Table 1. The sample demonstrated substantial variation in age, with Adolescent participants (aged 10-19 years) represented 10% of the sample (n = 10), while adults (aged ≥20 years) represented 90% (n = 90).

Table 1: Demographic Characteristics and Smoking Patterns Among Respondents (N = 100)

Variable	f	%
Age		
Adolescent (10-19 years)	10	10.0
Adult >20 years)	90	90.0
Smoking Pattern		
Conventional cigarettes only	76	76.0
Dual use (Conventional + Electronic)	24	24.0
Nicotine Dependence - Conventional (FTND)		
Mild dependence (0-3)	26	26.0
Moderate dependence (4-6)	58	58.0
Severe dependence (7-10)	16	16.0
Nicotine Dependence - Electronic (ECDI) (Among n = 24 dual users)		
No dependence (0-2)	17	70.8
Mild dependence (3-5)	7	29.2

Among the 100 respondents, conventional cigarette smoking was the predominant tobacco use pattern, with 76% (n = 76) reporting exclusive use of conventional cigarettes. However, a substantial proportion 24% (n = 24) reported concurrent use of both conventional cigarettes and electronic cigarettes, constituting the dual use subgroup. This prevalence aligns closely with published epidemiological estimates from similar Indonesian community settings (Moeis et al., 2024a).

The Fagerström Test for Nicotine Dependence scores revealed a concerning pattern of significant dependence among the study population. Mild dependence (FTND scores 0-3) was documented in 26% of respondents (n = 26), representing the smallest proportion of the sample. Moderate dependence (FTND scores 4-6), the most prevalent category, was observed in 58% of respondents (n = 58), indicating that more than half of the study population experienced substantial difficulty controlling conventional cigarette consumption and experience significant withdrawal symptoms when attempting cessation. Severe dependence (FTND scores 7-10) was documented in 16% of respondents (n = 16), representing a concerning minority experiencing pronounced neurobiological adaptations to nicotine and extreme difficulty achieving sustained abstinence.

The predominance of moderate to severe dependence (74% combined) underscores the substantial neurobiological challenge that smoking cessation represents for this population. The FTND scale items assessment patterns suggest that many respondents reported smoking their first cigarette within

5 minutes of waking (an FTND criterion), difficulty refraining from smoking in prohibited locations, and inability to abstain even during acute illness—all indicators of strong psychological and physiological dependence.

Among the 24 dual users, electronic cigarette dependence assessment using the Electronic Cigarette Dependence Index revealed a contrasting pattern. The majority 70.8% (n = 17). Demonstrated no electronic cigarette dependence (ECDI scores 0-2), suggesting that many respondents utilized electronic cigarettes as occasional supplemental nicotine sources without developing strong dependence on the electronic product specifically. However, 29.2% of dual users (n = 7) exhibited mild electronic cigarette dependence (ECDI scores 3-5), indicating psychological and mild physiological adaptation to electronic product use.

Notably, no respondents in the dual use group demonstrated severe electronic cigarette dependence, suggesting that the electronic cigarette functions primarily as a supplemental nicotine delivery device rather than a replacement product. This utilization pattern contrasts with the strategic marketing narrative positioning electronic cigarettes as smoking cessation aids. Instead, the data suggest that respondents maintained heavy reliance on conventional cigarettes while using electronic cigarettes to facilitate smoking in restricted environments, extend overall nicotine delivery throughout the day, or experience sensory novelty.

The coexistence of high conventional cigarette dependence (74% moderate to severe) with relatively low electronic cigarette dependence (70.8% no dependence) in dual users reveals a critical distinction: respondents maintained their primary nicotine dependence through conventional cigarettes while utilizing electronic cigarettes as supplemental devices. This pattern contradicts the harm reduction hypothesis and instead suggests a compounding exposure model in which electronic cigarettes extend and maintain overall nicotine dependence rather than facilitating reduction or cessation.

DISCUSSION

This study characterized the prevalence and dependence profiles associated with dual use smoking in a community sample of 100 respondents from Bandung, West Java. The principal findings demonstrated that while conventional cigarette smoking remains the predominant tobacco use pattern (76%), a substantial and concerning minority (24%) engaged in concurrent dual use of conventional and electronic cigarettes. Among all respondents, 74% demonstrated moderate to severe nicotine dependence from conventional smoking, while dual users exhibited variable dependence on electronic cigarettes with 70.8% reporting no dependence on the electronic product.

The observed prevalence of dual use at 24% aligns with epidemiological estimates from similar Indonesian community contexts. Published national survey data report dual use prevalence ranging from 20-30% among active smokers in several major urban centers (Moeis et al., 2024b; WHO, 2021a) . The proportion of conventional-only smokers (76%) similarly reflects Indonesia's tobacco landscape, in which conventional cigarette smoking particularly through low-cost, informal retail channels remains the primary tobacco consumption pattern among both adolescent and adult populations (Rahayu et al., 2025).

The dependence profile demonstrating moderate nicotine dependence as the modal category (58%) corroborates findings from longitudinal cohort studies including the PATH Study, which documented that established smokers with sustained use demonstrate predominantly moderate-to-high FTND scores reflecting neurobiological adaptation and difficulty with cessation (Coleman et al., 2022a; Snell et al., 2019). The concentration of dependence in the moderate-to-severe range (74%) indicates that this population experiences substantial

challenge with voluntary smoking reduction or cessation.

The finding that 70.8% of dual users reported no electronic cigarette dependence contrasts with some international research suggesting greater electronic cigarette dependence in certain populations (Raad et al., 2025), but aligns with studies suggesting that in contexts where electronic cigarettes are secondary products, dependence remains relatively modest . This distinction may reflect the affordability advantage of conventional cigarettes in Indonesia, making electronic cigarettes a supplemental rather than primary product (Syawqie et al., 2025).

The study included 10 adolescent participants (10% of sample), representing a small but critical subgroup. During adolescence, the prefrontal cortex and mesolimbic reward pathways continue active developmental remodeling (Placzek et al., 2009; Reynolds & Flores, 2021). Nicotine exposure during this period fundamentally disrupts normal neurodevelopmental processes. Adolescents initiating tobacco use demonstrate accelerated development of nicotine dependence compared to adult initiates, with some individuals developing dependence criteria after only weeks of sporadic use (Adjei et al., 2024; DiFranza et al., 2002). The presence of adolescents demonstrating moderate to severe dependence within this small group underscores this accelerated developmental trajectory.

Furthermore, adolescent participation in dual use particularly concerns researchers, as dual use provides multiple product-specific reinforcement mechanisms, potentially creating more robust dependence that proves more resistant to cessation interventions. The concurrent use of conventional and electronic cigarettes may exploit distinct neurobiological reward pathways through different nicotine delivery kinetics and sensory characteristics, creating particularly powerful conditioning effects (Islam et al., n.d.; Villanueva-Blasco et al., 2025).

The prevalence of moderate-to-severe nicotine dependence (74%) within the study population indicates that a substantial proportion of respondents would experience difficulty with autonomous smoking cessation despite health education or awareness campaigns alone. Behavioral and pharmacological interventions are likely necessary for most respondents to achieve sustained abstinence (Chen et al., 2025; Ji et al., 2024).

The dual use prevalence of 24% raises specific concerns regarding tobacco control strategy effectiveness. If electronic cigarettes were successfully functioning as smoking cessation aids as marketed, one would anticipate lower conventional cigarette consumption among electronic cigarette users. Instead, the data demonstrate concurrent product use with maintained high conventional cigarette dependence, suggesting that electronic cigarette marketing messages may not reflect actual population benefits and may contribute to the perception that dual use represents harm reduction (Coleman et al., 2022b; Hamoud et al., 2025).

Community health workers and nurses employed in primary healthcare settings require training in evidence-based, validated instruments such as the FTND for assessing dependence severity and tailoring interventions accordingly. Individualized assessment can facilitate matching of intervention intensity to dependence severity, with severe dependence necessitating pharmaceutical adjuncts (nicotine replacement therapy, varenicline, bupropion) combined with intensive behavioral counseling (Huard et al., 2024; Lee & Yu, 2025).

Given the high prevalence of dual use and moderate-to-severe dependence, multiple intervention levels prove necessary. Primary prevention strategies must target adolescent populations before tobacco initiation, as the accelerated dependence development in youth demands particular attention. School-based programs integrating accurate

information regarding dual use, nicotine pharmacology, electronic cigarette marketing deception, and evidence-based cessation strategies require urgent implementation (Raad et al., 2025; Razali et al., 2025).

Secondary prevention efforts should identify and intervene with early-stage users to prevent progression toward sustained use and dependence. Community health workers conducting outreach in residential settings can efficiently identify smokers through screening and provide brief counseling interventions with referral to cessation services for those demonstrating dependence (Cherodian et al., 2025; Huong et al., 2025).

Tertiary interventions targeting established smokers with high dependence require comprehensive, multimodal approaches. Cognitive-behavioral therapy addressing psychological dependence, pharmaceutical agents managing neurobiological adaptation, and peer support groups facilitating sustained behavior change represent evidence-based approaches. For dual users specifically, interventions must address the particular reinforcement provided by each product while emphasizing the compounding health risks rather than accepting the false harm reduction narrative (Hanifah et al., 2024; Lee Westmaas et al., 2022; Mohanty et al., 2025; Thombs et al., 2025; Yoshihara et al., 2025).

CONCLUSIONS AND RECOMMENDATION

This study documented that dual use of conventional cigarettes and electronic cigarettes constitutes a meaningful public health concern in community settings, affecting approximately one-quarter of active smokers. Most respondents demonstrated moderate nicotine dependence from conventional smoking, indicating substantial dependence on products with well-established severe health consequences. The absence of strong electronic cigarette dependence in most dual users suggests that electronic cigarettes function as supplemental products maintaining overall nicotine dependence rather than facilitating cessation.

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