

# The Early Onset of Nicotine Dependence, Severity of Substance Use Disorder, and Relapse: An Inpatient Study

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## Abstract

**Objective:** This study assessed the association between the early onset of smoking and the use of other addictive substances with nicotine dependence, the extent of substance abuse, and the probability of relapse, in drug treatment and rehabilitation centers.

**Methods:** Self-reported data were collected from July to September 2019 from 632 inpatients at five drug treatment facilities in the Philippines: two in the National Capital Region, one in Western Visayas, one in Central Visayas, and one in the Mindanao Region.

**Results:** The Addiction Severity Index (5th edition) and the Fagerström Test for Nicotine Dependence were used to assess the inpatients' drug and alcohol use and nicotine dependence severity, respectively. The participants were composed of approximately 45.57% non-nicotine-dependent former smokers and 54.43% nicotine-dependent current smokers. The overall prevalence rates of smoking onset (starting at age  $\leq 10$  years) of the respondents yielded an odds ratio (AOR) of 26.5 and 95% confidence interval (CI) of 10.8–64.9 in a period of 30 consecutive days, and an AOR of 28.9 and 95% CI of 11.5–72.9 within one's lifetime, indicating significant ( $p < .05$ ) low to moderate nicotine dependence.

**Conclusion:** This study suggests that to combat relapse there is a need for incorporating the implementation of nicotine cessation programs into addiction treatments as well as bans on any type of smoking activities by patients, both within and outside therapeutic drug treatment and rehabilitation centers in the Philippines.

## Keywords

Nicotine; Fagerström test for nicotine dependence; Nicotine dependence, Addiction severity index; Addiction severity; onset

## Introduction

Among substance use disorders (SUDs), nicotine dependence is the most difficult to overcome and requires the longest recovery time for those affected [1,2]. According to the United States National Institute on Drug Abuse, cigarette smoking increases the likelihood of relapse among people in drug abuse recovery programs. Cigarettes, which contain harmful chemical compounds, are extensively used by substance abusers, and they increase these people's health and mortality risks [3]. Despite joint efforts by the World Health Organization (WHO), through its Framework Convention on Tobacco Control, and the Philippine Department of Health to regulate tobacco use and their endorsement of its taxation, according to one study, tobacco still kills at least 87,600 Filipinos each year (240 deaths per day), one-third of whom are in the prime of their lives [4].

The fifth edition of the Addiction Severity Index (ASI) [5] and the Fagerström Test for Nicotine Dependence (FTND) [6] have been widely used to assess the severity of chemical dependence among individuals [3]. Studies have reported that those dependent on drugs or alcohol are more likely to be smokers than those who are not dependent [7,8]. Furthermore, these individuals are more likely to be heavy smokers, exhibiting nicotine dependence [9]. In this context, substance abuse prevention campaigns and the promotion of smoke-free rehabilitation centers are urgently needed. Although the literature depicts the interconnected relationship between cigarette smoking and the use of addictive substances such as alcohol, cocaine, heroin, cannabis, amphetamines, and methamphetamines, (e.g., nicotine dependence and substance use disorder) there remains a need for further study on

nicotine dependence and the application of methods for overcoming it in treatment programs devised to address dependence on other substances [3,10-12].

Thus, this study aimed to investigate the association of nicotine dependence with the early onset of smoking and the use of other addictive substances in drug treatment and rehabilitation centers.

## Materials and Methods

### Sample

We designed a cross-sectional survey that was carried out from July to September 2019 on 632 inpatients (ranging in age from 14 to 60 years) who were participating in a therapeutic program for 6 to 12 months, depending on whether their treatment was voluntary or mandatory due to criminal conviction. The 632 inpatients, who were residing in Department of Health's Treatment and Rehabilitation Centers (DOH-TRC) in the Philippines, met our study inclusion criteria (i.e., inpatients in primary treatment (with 6–12 months of residency) and voluntary surrenderees) and were surveyed after being informed of the study's purpose and consenting to participate. This

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study was approved by the institutional review board of Sahmyook University (approval #2-1040781-AB-N01-2017106HR).

### Data collection

We conducted face-to-face interviews with the patients, using a structured questionnaire. The survey was conducted in five different treatment locations: at two facilities in the National Capital Region (Metro Manila), one in Western Visayas (Region VI), one in Central Visayas (Region VII), and one in Region XI Mindanao.

### Measures

The Fagerström Test for Nicotine Dependence (FTND) was used to assess nicotine dependence using the question "How many cigarettes do you smoke?" Participants' answers were categorized into four dependence levels: low (10 or fewer cigarettes per day), low to moderate (11 to 20 cigarettes per day), moderate (21 to 30 cigarettes per day), and high (31 or more cigarettes per day) [13].

The fifth edition of the Addiction Severity Index (ASI) summary score was used to gauge the severity of the substance use disorder, using the question "How many times have you had alcohol/drugs in the past 30 days/your lifetime?" For substance use disorders (alcohol, methamphetamine, and cannabis), the participants' primary substance abuse was categorized into three severities: low (fewer than 10 times in 30 days), moderate (10–19 times in 30 days), and high (20 or more times in 30 days). Methamphetamine and cannabis use were both categorized into three substance use disorder severities: low (fewer than 10 times in 30 days), moderate (10–19 times in 30 days), and high (20 or more in 30 days) [5].

According to the U.S. National Institute on Drug Abuse, the time frames for the diagnosis of drug dependence are directly correlated with the patient's preliminary assessment and can range from 24 months [14-16]. In this study, early onset of nicotine dependence was defined as smoking initiation at the age of 10 years or below, when at least one entire cigarette was first smoked [17-19]. The age of nicotine onset was categorized into four groups: 10 years or below, 11–15 years, 16–20 years, and 21–30 years. Meanwhile, the early onset of alcohol and drug use was also analyzed and categorized into four groups: 14 years or below, 15–25 years, 26–40 years, and 41 years and above.

The independent variables examined in this study included the participants' sociodemographic characteristics, treatment facility locations, marital status (i.e., single, married, separated, cohabiting), educational attainment level (i.e., no formal education, primary or elementary, secondary, tertiary). The income level was defined as poor: below ₱7,890 or US\$156.38; low: ₱7,890–15,780 or US\$156.38–312.83; low to moderate: ₱15,780–31,560 or US\$156.38–624.90; and moderate to high: ₱31,560–78,900 or US\$624.90–1,562.10 [20]. Furthermore, the living status (i.e., house owner, renter, living with relatives, no permanent dwelling), occupation (i.e., formal, informal), number of dependents (i.e., relatives or children: none or with), and treatment duration (i.e., primary 6–12 months, secondary admission) were taken into account. The participants' information regarding these variables were elicited through their self-reports before being admitted to the facilities and before the survey.

### Data analysis

Data were analyzed using the statistical software STATA/MP 14.0 (STATA Corp., College Station, TX, USA), employing a significance level of  $p < .05$ . The respondents' age of early onset of nicotine

dependence, defined as smoking initiation at the age of 10 years or below and when at least one entire cigarette was first smoked, was first gauged using Pearson's  $\chi^2$  and Kendall's  $\tau$ -b test for continuous variables. We then used bivariate and multivariate analyses with the logit link to examine the relationship between the early onset of nicotine dependence and substance use disorder severity and relapse as our outcome and covariates of interests. To obtain significant regression model results, the reference category for the early onset of nicotine dependence was age (10 years and below, 11–15 years, 16–20 years, and 21–30 years). Multivariate logistic regression was used to indicate the impact of the independent variables on the dependent variables of early onset of nicotine dependence and support inferences regarding the role of nicotine dependence in SUDs based on the early onset of smoking.

### Results

Table 1 presents the participants' demographic characteristics. The 632 inpatients were composed of 62.50% males and 37.50% females, and their ages ranged from 14 to 60 years, with an average of 34.1 years (standard deviation [SD] = 9.11). Of these inpatients, 54.43% were nicotine-dependent current smokers. Altogether, 28.89% of the participants had experienced an early onset (below 10 years) of nicotine dependence, and 9.02% an early onset of alcohol and drug use.

Table 2 shows the inpatients' self-reports regarding alcohol or drug use over the past 30 days, 37.74% of the males with low severity for nicotine concurrently used methamphetamines (33.93%) and cannabis (30.91%) with high severity. The cumulative time participants engaged in substance abuse activities over 30 days and over one's life regarding the average alcohol use was 15.5 days (SD=7.8) and 3.5 years (SD=5.58), average methamphetamine use 15.07 days (SD=8.65) and 6.22 years (SD=5.84), and average cannabis (marijuana) use was 15.54 days (SD=7.80) and 6.22 years (SD=5.84).

As shown in Table 3, the overall early onset of nicotine dependence by treatment facility location was significantly associated with gender (males: adjusted odds ratio [AOR]=7.1, 95% confidence interval [CI]=1.1–45.7, all  $p$ -values  $\leq .05$ ), consistently increasing with the number of years of drug use activity within one's lifetime (AOR=9.6, 95% CI=1.6–57.4, all  $p$ -values  $\leq .05$ ). Furthermore, it was significantly related to marital status (males: AOR=0.3, 95% CI=0.1–0.9; females: AOR=0.3, 95% CI=0.1–0.7), elementary education level (males: AOR=12.6, 95% CI=2.9–55.4; females: AOR=12.2, 95% CI=2.8–53.01), and overall income level (males: AOR=4.3, 95% CI=1.4–13.2; females: AOR=188.7, 95% CI=8.5–4197.04). Living status, occupation, treatment center, treatment duration, and the number of dependents were shown to have small correlations with the early onset of smoking and substance use disorder severity.

### Discussion

Studies have reported a history of cigarette smoking among as many as three-fourths of adults with SUDs [19,21-24]. Several possible reasons have been cited to explain the increase in the likelihood of relapse owing to smoking, such as cigarette smoking becoming a "pull" for illicit drug use, with nicotine dependence leading to increased alcohol and drug use [19, 25,26]. This study supports the findings of the U.S. National Institute on Drug Abuse that nicotine dependence increases the likelihood of relapse among inpatients with SUDs [27]. In our study, the early onset of nicotine dependence was defined as smoking initiation at the age of 10 years and below, when at least one entire cigarette was smoked [18,24-28]. Likewise, the early onset of alcohol consumption and use of drugs such as methamphetamines and

Variable	Percentage or Mean ± SD
Age	34.10 ± 9.11
Gender	
Male	395 (62.50%)
Female	237 (37.50%)
Department of Health Drug Treatment and Rehabilitation Centers	
Treatment duration	6.48 ± 1.66
Fagerström Test for Nicotine Dependence	
Former smoker, non-nicotine dependent	288 (45.57 %)
Smoker, nicotine dependent	344 (54.43 %)
Onset of smoking/age of initiation	12.13 ± 8.12
Addiction Severity Index, 5th edition (primary substance use)	
Alcohol (any use at all, 30 days)	15.5 ± 7.80
Alcohol toxicity (30-day use)	5.91 ± 5.57
Alcohol (number of years/lifetime use)	3.57 ± 5.58
Methamphetamines (30-day use)	15.07 ± 8.65
Methamphetamines (number of years/lifetime use)	6.22 ± 5.84
Cannabis (marijuana; 30-day use)	15.54 ± 7.80
Cannabis (marijuana; number of years/lifetime use)	3.88 ± 2.70
Onset of alcohol and illicit drug use	17.9 ± 8.15

Note: SD, standard deviation

Table 1: The Fagerström Test for Nicotine Dependence and Addiction Severity Index summary score.

Early Onset of Nicotine	Males = 395 n (%)					p-value	Females = 237 n (%)					p-value
	≤ 10 years	11–15 years	16–20 years	21–30 years	≤ 10 years		11–15 years	16–20 years	21–30 years			
Treatment facility locations											0.438	
NCR-Manila	40 (31.50)	40 (31.50)	42 (33.07)	5 (3.94)	0.063	40 (29.85)	36 (26.87)	37 (27.61)	21 (15.67)			
Visayas Region	30 (34.88)	24 (27.91)	28 (32.56)	4 (4.65)		20 (28.57)	18 (25.71)	26 (37.14)	6 (8.57)			
Mindanao Region	32 (28.32)	32 (28.83)	37 (33.33)	10 (9.01)		7 (25.93)	9 (33.33)	10 (37.04)	1 (3.70)			
Marital status					0.099						0.282	
Single	71 (32.13)	73 (33.03)	63 (28.51)	14 (6.33)		38 (25.85)	47 (31.97)	41 (27.89)	21 (14.29)			
Married	21 (23.08)	35 (38.46)	29 (31.87)	6 (6.59)		13 (30.23)	9 (20.93)	16 (37.21)	5 (11.63)			
Separated	15 (26.32)	11 (19.30)	28 (49.12)	3 (5.26)		6 (40.00)	1 (6.67)	7 (46.67)	1 (6.67)			
Cohabiting	6 (26.09)	11 (47.83)	5 (21.74)	1 (4.35)		10 (38.46)	6 (23.08)	9 (34.62)	1 (3.85)			
Educational level					0.036						0.092	
No formal education	6 (66.67)	2 (22.22)	1 (11.11)	0 (0.00)		2 (14.29)	2 (14.29)	8 (57.14)	2 (14.29)			
Primary	6 (13.64)	16 (36.36)	16 (36.26)	6 (13.64)		5 (15.63)	15 (46.88)	10 (31.25)	2 (6.25)			
Secondary	40 (28.99)	44 (31.88)	43 (31.16)	11 (7.97)		40 (30.77)	35 (26.92)	39 (30.00)	16 (12.31)			
Tertiary	61 (30.35)	68 (33.83)	65 (32.34)	7 (3.48)		20 (36.36)	11 (20.00)	16 (29.09)	8 (14.55)			
Income level					0.004						0.233	
Poor	58 (40.85)	41 (28.87)	40 (28.17)	3 (2.11)		34 (28.57)	36 (30.25)	40 (33.61)	9 (7.56)			
Low	20 (23.81)	26 (30.95)	29 (34.52)	9 (10.71)		20 (34.48)	15 (25.86)	12 (20.69)	11 (18.97)			
Moderate	11 (16.18)	30 (44.12)	23 (33.82)	4 (5.88)		3 (14.29)	6 (28.57)	9 (42.86)	3 (14.29)			
High	24 (24.49)	33 (33.67)	33 (33.67)	8 (8.16)		10 (30.30)	6 (18.18)	12 (36.36)	5 (15.15)			
Living status					0.000						0.000	
House owner	45 (22.28)	83 (41.09)	60 (29.70)	14 (6.93)		21 (22.11)	26 (27.37)	38 (40.00)	10 (10.53)			
Renter	5 (17.24)	14 (48.28)	5 (17.24)	5 (17.24)		13 (48.15)	2 (7.41)	2 (7.41)	10 (37.04)			
Living w/ relatives	54 (38.03)	31 (21.83)	52 (36.62)	5 (3.52)		28 (29.17)	34 (35.42)	26 (27.08)	8 (8.33)			
No permanent dwelling	9 (47.37)	2 (10.53)	8 (42.11)	0 (0.00)		5 (38.46)	1 (7.69)	7 (53.85)	0 (0.00)			
Occupation					0.000						0.317	
Informal occupation	81 (37.85)	68 (31.78)	53 (24.77)	12 (5.61)		49 (29.52)	46 (27.71)	55 (33.13)	16 (9.64)			
Formal occupation	32 (17.98)	62 (34.83)	72 (40.45)	12 (6.74)		18 (27.69)	17 (26.15)	18 (27.69)	12 (18.46)			

Dependents					0.007					0.760
No dependents	73 (34.11)	56 (26.17)	72 (33.64)	13 (6.07)		39 (29.55)	39 (29.55)	39 (29.55)	15 (11.36)	
With dependents	40 (22.47)	74 (41.57)	53 (29.78)	11 (6.18)		28 (28.28)	24 (24.24)	34 (34.34)	13 (13.13)	
Treatment Program (DOH-TRC)					0.003					0.190
Primary (6-12 mo.)	91 (26.22)	122 (35.16)	110 (31.70)	24 (6.92)		53 (26.77)	57 (28.79)	62 (31.31)	26 (13.13)	
Secondary admission	22 (48.89)	8 (17.78)	15 (33.33)	0 (0.00)		14 (42.42)	6 (18.18)	11 (33.33)	2 (6.06)	
Nicotine dependence					0.000					0.000
Low	91 (43.96)	43 (20.77)	57 (27.40)	16 (7.73)		47 (49.47)	10 (10.53)	30 (31.58)	8 (8.42)	
Low-moderate	9 (9.89)	36 (39.56)	39 (42.86)	7 (7.69)		15 (18.07)	25 (30.12)	31 (37.35)	12 (14.46)	
Moderate	10 (12.35)	45 (55.56)	25 (30.86)	1 (1.23)		5 (18.52)	16 (59.26)	2 (7.41)	4 (14.81)	
High	3 (23.08)	6 (46.15)	4 (30.77)	0 (0.00)		0 (0.00)	12 (46.15)	10 (38.46)	4 (15.38)	
Onset of alcohol and drugs					0.000					0.000
≤ 14	19 (82.61)	2 (8.70)	1 (4.35)	1 (4.35)		19 (76.00)	2 (8.00)	4 (16.00)	0 (0.00)	
15–25	31 (26.50)	77 (65.81)	9 (7.69)	0 (0.00)		14 (25.45)	35 (63.64)	2 (3.64)	4 (7.27)	
26–35	32 (23.53)	37 (27.21)	64 (47.06)	3 (2.21)		10 (12.82)	20 (25.64)	44 (56.41)	4 (5.13)	
36–40	31 (26.72)	14 (12.07)	51 (43.97)	20 (17.24)		24 (32.88)	6 (8.22)	23 (31.51)	20 (27.40)	
Primary substance use disorder severity										
Alcohol dependence					0.046					0.761
Low severity	20 (37.74)	21 (39.62)	7 (13.21)	5 (9.43)		19 (27.54)	19 (27.54)	22 (31.88)	9 (13.04)	
Moderate severity	21 (21.65)	34 (35.05)	35 (36.08)	7 (7.22)		23 (32.86)	16 (22.86)	20 (28.57)	11 (15.71)	
High severity	72 (29.75)	75 (30.99)	83 (34.30)	12 (4.96)		25 (27.17)	28 (30.43)	31 (33.70)	8 (8.70)	
Methamphetamines dependence					0.023					
Low severity	27 (22.69)	51 (42.86)	38 (31.93)	3 (2.52)		21 (27.63)	24 (31.58)	19 (25.00)	12 (15.79)	0.499
Moderate severity	38 (33.93)	28 (25.00)	40 (35.71)	6 (5.36)		19 (35.85)	12 (22.64)	17 (32.08)	5 (9.43)	
High severity	48 (30.00)	50 (31.25)	47 (29.38)	15 (9.38)		26 (25.74)	27 (26.73)	37 (36.63)	11 (10.89)	
Cannabis dependence					0.351					0.741
Low severity	17 (26.15)	29 (44.62)	17 (26.15)	2 (3.08)		23 (31.51)	19 (26.03)	22 (30.14)	9 (12.33)	
Moderate severity	45 (27.78)	55 (33.95)	51 (31.48)	11 (6.79)		19 (24.36)	23 (29.49)	29 (37.18)	7 (8.97)	
High severity	51 (30.91)	46 (27.88)	57 (34.55)	11 (6.67)		25 (31.25)	21 (26.25)	22 (27.50)	12 (15.00)	
$p \leq .001, p \leq 0.005$										

Table 2: Sociodemographic characteristic of each variable to early onset of nicotine dependence

Early Onset of Smoking	Past 30-Days of Substance Use				Number of Years, Lifetime Use			
	Overall Early Onset of Smoking Based on the Past 30 Days	p-values	Males AOR (95% CI)	Females AOR (95% CI)	Overall Early Onset of Smoking in Lifetime Use	p-values	Males aAOR (95% CI)	Females aAOR (95% CI)
Marital status								
Single	Reference		Reference	Reference	Reference		Reference	Reference
Married	1.3 (0.7–2.5)	0.452	1.4 (0.6–3.2)	0.9 (0.2–5.4)	1.3 (0.7–2.7)	0.340	1.4 (0.6–3.3)	1.8 (0.3–9.7)
Separated	1.1 (0.5–2.4)	0.860	0.9 (0.4–2.6)	0.4 (0.04–3.5)	1.1 (0.5–2.4)	0.878	1.0 (0.4–2.6)	0.9 (0.1–8.8)
Cohabiting	0.3 (0.1–0.9)	0.028	0.6 (0.2–2.4)	0.02 (0.001–0.9)	0.3 (0.1–0.7)	0.028	0.5 (0.1–1.8)	0.3 (0.1–5.8)
Education level								
None	Reference		Reference	Reference	Reference		Reference	Reference
Primary	12.6 (2.9–55.4)	0.001	30.4 (2.9–308.3)	8.6 (0.2–351.9)	12.2 (2.8–53.01)	0.001	45.6 (4.4–469.6)	6.0 (0.2–209.4)
Secondary	1.8 (0.6–5.8)	0.333	2.6 (0.4–17.9)	2.3 (0.1–48.9)	1.8 (0.6–5.9)	0.308	4.7 (0.7–32.7)	0.7 (0.04–13.9)
Tertiary	1.2 (0.4–4.1)	0.721	3.0 (0.4–20.9)	0.4 (0.02–10.4)	1.4 (0.4–4.7)	0.569	5.9 (0.9–41.8)	0.3 (0.01–6.2)
Income								
Poor	Reference		Reference	Reference	Reference		Reference	Reference
Low	2.9 (1.3–6.2)	0.008	1.9 (0.7–5.1)	11.2 (1.8–71.7)	2.9 (1.3–6.5)	0.007	1.9 (0.7–5.0)	8.5 (1.3–53.9)
Moderate	6.4 (2.5–16.6)	0.000	4.3 (1.4–13.2)	188.7 (8.5–4197.04)	8.9 (3.3–24.8)	0.000	3.9 (1.2–12.6)	260.3 (10.48–6465.8)

High	1.9 (0.8–4.4)	0.129	1.3 (0.5–3.5)	19.5 (1.3–284.2)	1.9 (0.8–4.4)	0.154	1.2 (0.4–3.3)	4.1 (0.30–56.4)
Living status								
House owner	Reference		Reference	Reference	Reference		Reference	Reference
Renter	0.5 (0.2–1.4)	0.177	1.0 (0.3–3.9)	0.8 (0.1–9.9)	0.7 (0.2–1.8)	0.415	1.4 (0.4–5.2)	0.5 (0.3–6.5)
Living with relatives	0.4 (0.3–0.8)	0.003	0.4 (0.2–0.9)	0.2 (0.03–0.9)	0.5 (0.3–0.9)	0.024	0.6 (0.3–1.2)	0.3 (0.1–1.39)
Non-settlers	0.3 (0.1–0.9)	0.33	0.3 (0.7–1.6)	0.1 (0.002–1.1)	0.2 (0.1–0.7)	0.009	0.3 (0.6–1.3)	0.03 (0.002–0.6)
Occupation								
Informal occupation	Reference		Reference	Reference	Reference		Reference	Reference
Formal occupation	1.5 (0.8–3.0)	0.213	2.7 (1.2–6.3)	0.1 (0.02–0.9)	1.5 (0.7–2.9)	0.284	2.6 (1.1–6.1)	0.6 (0.10–3.9)
Dependents								
None	Reference		Reference	Reference	Reference		Reference	Reference
With	0.7 (0.4–1.2)	0.554	0.7 (0.4–1.4)	0.5 (0.1–1.9)	0.8 (0.5–1.4)	0.524	1.0 (0.5–2.0)	0.3 (0.1–1.3)
Treatment duration (DOH-TRC)								
Primary (6–12 mo.)	Reference		Reference	Reference	Reference		Reference	Reference
Secondary admission	0.8 (0.4–1.7)	0.554	0.8 (0.3–2.2)	0.6 (0.1–4.7)	0.9 (0.4–1.9)	0.708	0.6 (0.2–1.8)	0.8 (0.1–6.6)
Nicotine dependence								
Low	Reference		Reference	Reference	Reference		Reference	Reference
Low-moderate	48.9 (18.1–132.2)	0.000	27.9 (8.3–93.6)	455.6 (37.1–5596.9)	41.7 (15.6–111.1)	0.000	19.3 (5.9–62.9)	1018.4 (66.9–15486.22)
Moderate	26.5 (10.8–64.9)	0.000	20.6 (6.9–60.9)	197.3 (17.5–2226.7)	28.9 (11.5–72.9)	0.000	20.4 (6.7–61.9)	273.50 (21.6–3457.76)
High	269.9 (38.4–1898.2)	0.000	7.1 (1.1–45.7)	–	248.6 (35.8–1726.3)	0.000	9.6 (1.6–57.4)	–
Onset of alcohol and drug								
<14	Reference		Reference	Reference	Reference		Reference	Reference
15–25	80.8 (21.5–304.2)	0.000	36.2 (6.3–205.1)	0.4 (0.1–2.2)	92.7 (24.3–353.6)	0.000	44.3 (8.1–241.4)	0.8 (0.2–4.3)
26–35	284.9 (69.7–1165.8)	0.000	96.4 (15.4–605.1)	4.4 (0.9–19.6)	287.04 (70.1–1175.1)	0.000	100.4 (16.6–607.6)	13.7 (2.6–72.5)
36–40	111.7 (28.37–439.9)	0.000	48.1 (7.9–292.4)	–	95.1 (24.3–372.01)	0.000	37.8 (6.6–216.8)	–
Primary substance use disorder severity								
Alcohol dependence								
Low severity	Reference		Reference	Reference	Reference		Reference	Reference
Moderate severity	1.7 (0.8–3.4)	0.157	4.3 (1.5–12.1)	0.2 (0.04–1.2)	1.3 (0.5–3.4)	0.615	0.6 (0.2–2.3)	4.3 (0.6–32.9)
High severity	1.5 (0.8–2.9)	0.180	2.4 (1.0–5.9)	1.6 (0.3–7.3)	0.7 (0.4–1.2)	0.183	0.3 (0.1–0.7)	3.3 (0.7–14.3)
Methamphetamines dependence								
Low severity	Reference		Reference	Reference	Reference		Reference	Reference
Moderate severity	0.6 (0.8–3.4)	0.387	0.7 (0.3–1.7)	0.5 (0.1–2.1)	0.4 (0.2–0.8)	0.009	0.4 (0.2–0.9)	0.3 (0.04–1.9)
High severity	0.9 (0.5–1.7)	0.831	0.7 (0.3–1.5)	1.5 (0.3–6.5)	0.8 (0.3–2.0)	0.576	0.9 (0.3–3.1)	0.2 (0.02–1.8)
Cannabis dependence								
Low severity	Reference		Reference	Reference	Reference		Reference	Reference
Moderate severity	0.8 (0.4–1.6)	0.521	0.8 (0.3–2.2)	1.5 (0.3–7.7)	1.4 (0.8–2.6)	0.174	1.3 (0.6–2.6)	3.1 (0.7–12.9)
High severity	0.8 (0.4–1.6)	0.502	0.9 (0.3–2.3)	0.3 (0.06–1.6)	2.1 (1.1–3.9)	0.019	1.6 (0.7–3.5)	8.4 (1.6–43.2)
Probability Chi-squared	0.000		0.000	0.000		0.000	0.000	0.000
Hosmer-Lemeshow Chi-squared		1366.95 (p = 0.000)	452.72 (p = 0.002)	168.39 (p = 0.1447)		1391.06 (p = 0.000)	544.98 (p = 0.000)	3294.47 (p = 0.000)

**Note:** CI, confidence interval; DOH-TRC, Department of Health Treatment Rehabilitation Centers in two areas of the National Capital Region; AOR, adjusted odds ratio. The Fagerström Test for Nicotine Dependence (FTND) was used to assess nicotine dependence using the question "How many cigarettes do you smoke per day?" Answers were classified as either low (10 or less), low to moderate (11 to 20), moderate (21 to 30), or high (31 or more sticks per day). The 5<sup>th</sup> edition of the Addiction Severity Index (ASI) was used to assess addiction severity using the question "How many times have you had alcohol/drugs in the past 30 days and years?" The summary score represents the average severity of the substance use disorder ( $p < .005$ ). Age of onset is defined as  $\leq 10$  years up to late onset  $\geq 21$  up to 40 years. For nicotine dependence, 26 observations were dropped and not used, and for the onset of alcohol, 19 missing observations were dropped.  $p \leq .001$ ,  $p \leq 0.005$ , in interactions with days and lifetime use.

**Table 3:** Bivariate and multivariate analysis of factors associated with the early onset of nicotine dependence and substance use disorder in two time-periods: past 30-day use and lifetime use.



cannabis are significant factors of nicotine dependence in the adult with (lifetime) SUDs [17,21-29].

In recent years, the government of the Philippines has taken active measures to reduce tobacco use in the country [4,30]. We found smoking onset at the age of 10 years and below to be strongly associated with nicotine dependence, corroborating previous research that has identified the onset age as a potential risk factor for SUD relapse among patients who engage in alcohol use (53%), methamphetamine use (41%), and marijuana use (42%) [1,17,19]. For the current smokers in our study, nicotine dependence was found to increase the risk of drug recurrence by 53.43%. Nonetheless, 45.57% of the non-nicotine-dependent former smokers still had a high risk of drug relapse while under treatment for 6 to 12 months.

The sociodemographic factors included as covariates in our study, such as treatment facility locations, marital status, educational attainment level, income, living status, occupation, and the number of dependents, widely varied in their association with smoking behaviour [31,32]. A previous study, for example, found smoking to be unrestrained and socially accepted in the entire Philippines. A low educational attainment level is also a determinant in the increase of nicotine dependence and substance use disorder severity in both males (AOR = 30.4, 95% CI = 2.9–308.3) and females (AOR = 8.6, 95% CI = 0.2–351.9 [33]. Aside from this, having a lower income may increase the likelihood of smoking onset and substance use disorder [34]. Furthermore, being poor or a low-income earner increases the probability of smoking onset to greater nicotine use [33]. More females were found to have had an early onset of smoking (AOR = 188.7, 95% CI = 8.5–4197.04) than males [35].

This study found living status to have an insignificant association with the likelihood of the early onset of nicotine and substance use disorder severity; however, residence in rural areas has been shown to increase nicotine dependency in a study [36].

Self-report surveys frequently documented the respondent's occupation. For our participants, their occupations may be classed as being connected to "drug peddling" or "crime-related cases" under the government's "War on Drugs" policy, which could be the reason for their landing in rehabilitation facilities. Nevertheless, the main goal of this study was to infer the outcome severity of nicotine and substance use from the early onset of smoking [37,38].

The five different treatment facilities we selected for recruiting participants provide comprehensive services for therapeutic community treatment. However, there is a greater risk of nicotine relapse in a brief amount of time at the smoking cessation facility, when inpatients who are released regain access to nicotine smoking [39]. Our research established a close association between the early onset of nicotine dependence and that of alcohol and substance use and vice versa, in line with the findings of other studies [40-42]. The strength of this study is its use of standardized tools (i.e., the ASI and the FTND) to examine a nationwide cross-section of the population of interest. Our findings fill a gap in the literature by specifically examining the association between the early onset of nicotine use and dependence and the possibility of substance abuse relapse among inpatients with SUDs in the Philippines.

This study found that by the onset of smoking, the ASI could reveal a significant relationship with the severity of nicotine dependence. However, the FTND overview score can serve as an alternative indicator of nicotine dependence, distinct from tolerance to narcotics or alcohol; moreover, both tools have been shown to exhibit a minimal statistical

association with each other, as analysed [3,43-45]. Future longitudinal studies should therefore be conducted to validate our results.

## Strengths and Limitations

Several limitations have been found in this study, such as the likelihood of memory bias, inherent in the use of self-reported data. We anticipated that the Addiction Severity Index summary score response levels would vary by area due to regional differences in substance use and the limited number of inpatients that fit our inclusion criteria for primary treatment (i.e., 6–12 months of treatment, voluntary surrenderees).

## Conclusion

This study suggests that to combat relapse there is a need for incorporating the implementation of nicotine cessation programs into addiction treatment and bans on any type of smoking activity of patients, both within and outside therapeutic drug treatment rehabilitation centers in the Philippines. Smoking interventions and follow-ups from 6 months to 2 years should be recommended to inpatients, irrespective of whether they still smoke. Moreover, the FTND should be used in every treatment facility, included in all brief substance-related interventions, and routinely applied in clinical practice.

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## Disclosure

The authors have no competing interests to declare.

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