Original Article

Correlation of Smoking Habit and Level of Nicotine Dependence in University Students

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Submitted: March 13th, 2022
Accepted: November 27th, 2022
Published: February 28th, 2023

Respir Sci. 2023; 3(2): 94-102
https://doi.org/10.36497/respirsci.v3i2.54

Abstract

Background: Smoking habits are still a global problem. One of the harmful compounds in cigarettes is nicotine which gives a dependence effect on its users because long-term exposure can cause desensitisation of nicotinic acetyhlcoline receptor. This study aimed to determine the correlation between degree of smoking habit and level of nicotine dependence in actively smoking university students.

Method: A cross-sectional study was conducted using questionnaires, consisted of relating factors questionnaire (age, BMI, academic major, allowance, family smoking habits, and social environment), degree of smoking behavior questionnaire (Brinkman Index/IB), and Fagerstorm Test for Nicotine Dependence/FTND questionnaire.

Results: There were 124 active smoker university students included in this study. This study found that the higher the BI score, the higher the FTND score (P<0.001; r=0.420). In addition, this study also found that there were positive correlations between age (P=0.009; r=0.223), personal income (P=0.003; r=0.261), and academic major (P=0.042) with the levels of smoking habit. There was also correlation between allowance (P=0.005; r=0.249) with level of nicotine dependence.

Conclusion: These results indicate a significant moderate correlation between smoking habit with nicotine dependence among university students.

Keywords: Brinkman, Fagerstorm, nicotine, smoker, student.

INTRODUCTION

Smoking is still a major health problem in the world. Based on the World Health Organization (WHO) data, there were more than 1.1 billion tobacco smoker out of 7.38 billion population in 2015.[1,2] As many as 80% of the 1.1 billion smokers live in low to middle income countries.[3] Based on the 2018 Riset Kesehatan Dasar (Riskesdas) data, the prevalence of smoking in Indonesia is also high at 28.8%, although there is a decrease number

compared to the 2013 Riskesdas data (29.3%).[4]

While looking at the age group, many Indonesian smokers are also in their teens or young adults. Proportion of smoker above 10 years old are 12.7% in daily smoker and 6.9% in occasionally smoker among ages 15-19 years. Another group of ages 20-24 years have proportion of smoker are 27.3% (daily smoker) and 5.9% (occasionally smoker) based on Riskesdas 2018.[5]

Data from Global Adult Tobacco Survey (Indonesia report 2011) proportion of male smokers are still greater women, with the number of active male smokers aged over 15 years of 76.1%. This data shows the high number of active male smokers in young age groups in Indonesia.[6]

Cigarettes contain many harmful substances, including nicotine, which gives an addictive effect on smokers.[7] The WHO declares that more than 6 million people died from active smoking.[3] Data from Indonesia also shows a high prevalence of smokers among adolescents and young adults, where students included in those group.

However, there is no data regarding the degree of smoking habits and the level of nicotine dependence on active smoker among university students. Therefore, this study aimed to look for the correlation between smoking habits and the level of nicotine dependence on active smoker students at university in Depok

METHOD

This is a cohort prospective study, conducted in March-July 2020. This study was conducted on pulmonary TB patients who were treated at MDR-TB Polyclinic at dr. Saiful Anwar Malang. The inclusion criteria in this study were patients diagnosed with rifampicin-resistant pulmonaryTB, aged 18-65 years, who were willing to participate in the study and signed an informed consent. Patients who had received anti-MDR-TB drugs for ≥1 month, patients with Human Immunodeficiency Virus (HIV) and pregnant women were not included in this study.

The minimum sample size was 38. Samples were obtained by means of consecutive sampling that fulfilled the criterias. In this study, 39 subjects who met the inclusion and exclusion criteria were subjected to Acid Fast Bacillus (AFB) sputum smear and IL-2 levels measurement on day 0 and day 30 after receiving MDR-TB treatment (Shorter Regimen/Longer Regimen).

This was a cross-sectional study conducted in the university in Depok from July to August 2019. The research instrument used in this study consisted of three types of questionnaires. The first one is a questionnaire to obtain demographic data, including age, height, weight, allowance, academic major, smoking habits of the nuclear family, and smoking habits in the social environment.

The second questionnaire is a questionnaire to assess the degree of smoking habit (the Brinkman Index/BI). The last one is Fagerstorm Test for Nicotine Dependence (FTND), a questionnaire that is used to assess an individual's level of dependence on nicotine. This test is designed to calculate the level of dependency on nicotine and its relationship with smoking activity.

The smoking activity in this questionnaire includes quantity, motivation, and also symptoms of dependence on nicotine consumption in cigarettes or other nicotine-containing products.[17] This test has a score range of 0-10. The higher the score obtained, the higher the level of the person's dependence on nicotine. The independent variable in this study was the degree of smoking habit, which is calculated using the Brinkman Index. The dependent variable was the level of nicotine dependence.

The subjects included in this study were undergraduate students at the university in Depok, male, and active smoker. Subjects who were willing to participate in the study must sign an informed consent form. The total sample was 124 subjects obtained from students of the natural sciences and social sciences. The sample size was calculated using a single data proportion formula, with the prevalence of smokers was 67% as it was the prevalence of male smokers in Indonesia according to the 2011 GATS. The subjects who met the research criteria were consecutively recruited in the study until reached the minimum sample size.

The data is then processed and analyzed. Numerical data will be analyzed with Pearson Correlation, if the data is normally distributed or Spearman Correlation, if the data is not normally distributed. Meanwhile, categorical-numeric data will be analyzed by t test, if the data is normally distributed or by Mann-Whitney test, if the data is not normally distributed.

RESULTS

The characteristics of the subjects are shown in Table 1, including data on age, body mass Index (BMI), academic major, allowance, family smoking habits, and social environment.

Table 1. Characteristic of the Study Subjects

Characteristics	N (%)
Age (years); median (range)	20 (17–27)
Body mass Index (BMI); mean±SD	24.28±4.58
Underweight (<18 kg/m^2)	6 (4.8%)
Normal (18-25 kg/m^2)	69 (55.6%)
Overweight (25-27 kg/m^2)	13 (10.5%)
Obese (>27 kg/m^2)	36 (29.1%)
Academic major	
Natural science	48 (38.7%)
Social science	76 (61.3%)
Allowance (per week)	
Rp0 – Rp500.000	28 (22.6%)
Rp500.000 – Rp1.000.000	46 (37.1%)
Rp1.000.000 – 1.500.000	16 (12.9%)
>Rp1.500.000	34 (27.4%)
Having an active smoker in nuclear family	
Yes	81 (65.3%)
No	33 (34.7%)
Having an active smoker in social environment	
Yes	124 (100%)
No	0 (0%)

The data were taken within 3 weeks and obtained 124 subjects which come from students of the natural sciences and social sciences. In addition to BMI, this study also obtained data of the mean of height (172.31±6.08 cm) and weight (72.22±14.93 kg). Distribution of smoking habits based on the Brinkman Index (BI) has three categories: mild (BI: 0 – 200), moderate (BI: 201 – 600), and heavy smoker (BI >600).

This study showed the median of BI was 46.5 and the minimum – maximum range was 1-280. We found total of 118 students (95.2%) were mild smoker and only 6 students (4.8%) were moderate smoker. There were no heavy smoker founded among smoker students. Mild smoker were mostly found from social science students (56.5%) compare from natural science students (38.7%). In other hand, moderate smoker students only found from social science students.

The level of nicotine dependence was measured by the Fagerstrom questionnaire, which contains 7 questions and then converted into a score that has a minimum and maximum range of 0-10. In addition, this score is categorized into 4 groups: low dependence (0-2), low to moderate dependence (3-4), moderate dependence (5-7), and high dependence (8-10). The normality test was carried out using the Kolmogorov-Smirnov test, and the data was not normally distributed (P<0.001). The median Fagerstrom score was 3 with a range of 0-9. Figure 1 showed the proportions of nicotine dependence level in two academic major (natural and social sciences).

This study also looked for the correlation between age, BMI, allowance with the levels of smoking habits (as Brinkman Index). A significant weak positive correlation was seen between age and allowance with Brinkman Index (P=0.009 and P=0.003 respectively) (Table 2).

Table 2. Correlation between Age, BMI, and Allowance with Brinkman Index

	Age	BMI	Allowance
Brinkman Index	r=0.223* P=0.009* n=124	r=0.099** P=0.276** n=124	r=0.261* P=0.003* n=124

Note: *Spearman correlation **Pearson correlation

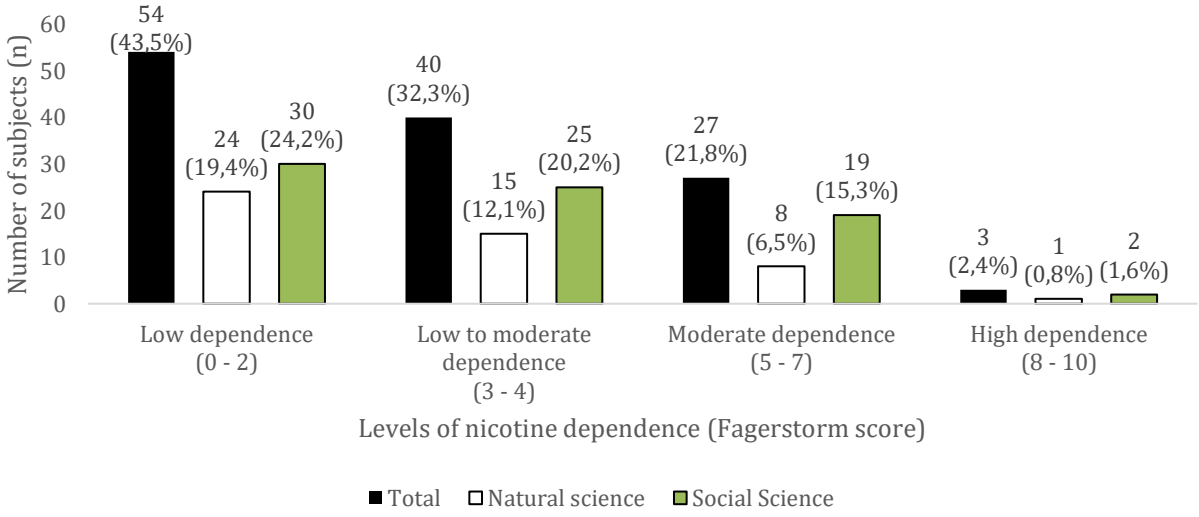

Figure 1. Proportion of nicotine dependence level (Fagerstrom score)

Table 3. Correlation of Academic Major and Smoking Habits in Nuclear Family with the Levels of Smoking Habit

Brinkman Index	Median (Range)	P
Natural science (n=48)	36 (2–200)	0.042
Social science (n=76)	60 (1–280)	
Having an active smoker in nuclear family (n=81)	50 (2–280)	0.212
No active smoker in nuclear family (n=43)	40 (1–204)	

Note: Mann-Whitney test.

Table 5. Relationship between academic major and smoking habits in nuclear family with Fagerstrom score

Fagerstrom score	Median (Range)	P
Natural science (n=48)	2.5 (0 – 8)	0.196
Social science (n=76)	3 (0 – 9)	
Having an active smoker in nuclear family (n=81)	3 (0 – 8)	0.370
No active smoker in nuclear family (n=43)	3 (0 – 9)	

Note: Mann-Whitney test.

In this present study, there was a statistically significant difference between academic major and Brinkman Index (P=0.042), yet no statistically significant difference was seen between the family smoking habit and Brinkman Index (Table 3).

No statistically significant correlation was found between age (P=0.458) and BMI (P=0.149) with Fagerstrom score. However, there was a significant weak correlation between allowance with Fagerstrom score (r=0.249; P=0.005) (Table 4).

Table 4. Correlation between Age, BMI, and Allowance with Nicotine Dependence Level

	Age	BMI	Allowance
Fagerstrom score	r=0.067 P=0.458 n=124	r=0.130 P=0.149 n=124	r=0.249 P=0.005 n=124

Note: Spearman correlation

We also did not found significant difference between the academic major and the smoking habits in nuclear family with the Fagerstrom score as in Table 5. This study found that levels of smoking habit (Brinkman Index) was significantly correlated with the levels of nicotine dependence (Fagerstrom score) (r=0.420; P<0.001) using Spearman correlation.

DISCUSSION

This present study showed median age of active smokers were 20 years old with a range of 17-27 years. This in in accordance with a study by Sutfin et al[8] which reveals that the mean age of smoking college students in United States was 20.5±2.9 years. Mean BMI of our subjects was 24.28±4.58 kg/m^2. This result is higher than the result from Hastuti et al who found that the mean BMI of smoking students was 22.30±4.39 kg/m^2.[9] Number of obese subjects in this study was also higher than Hastuti et al (29.1% vs 14.0%).

All subjects in this study have friends who are also active smokers. Meanwhile, 65.3% have active smokers in the nuclear family. A study by Resen also found similar results that the proportion of smoking students who have smoking parents are greater than those who have non-smoking parents.[10]

The Brinkman index in this study was relatively milder than other study because of the subjects were young population (teenager and young adults). These results are in line with the study by Amelia et al which found similar differences in the Brinkman index according to the subject's age group.[11]

This study revealed that the level of nicotine dependence on active smoker students was relatively low. This can be seen from the decreasing number of subjects from low to high nicotine dependence groups. Salameh et al also found similar results from 603 Lebanese students who filled out the Fagerstorm questionnaire.[12] The mean Fagerstrom score was 3.46±2.42 and there was a downward trend from light to heavy smokers. Lamin et al also reported similar results from student in Penang.[13]

We found a significant positive correlation between age and allowance with levels of smoking habit (Brinkman index). A similar result was seen in a study by Amelia et al.[11] The older a person is, the longer the duration of smoking. However, the correlation in our study was weak due to the younger age of our subjects (17-27 years). Perelman et al investigate the relationship between personal income of adolescents aged 14-17 years and smoking habit.[14] Adolescents who have the highest income had a tendency to become a daily smoker (OR=3.51), weekly smokers (OR=4.55), and had a higher smoking intensity (cigarette consumption) compared to the ones who have the lowest income.

Allowance was positively correlated to the levels of smoking habit (Brinkman index). Low-income adults are prone to have stress and psychological burden. Meanwhile, it is suspected that allowance has no effect on stress and psychological burden on students. As a result, students tend to have higher nicotine dependence as their allowance increases.

Smoking habit in social science students in this present study was significantly higher than the natural science students. Our study also found that there was no significant difference between family smoking habit and a person's smoking habit. Binita et al showed that there was no relationship between the number of smokers in the family and smoking behavior in vocational students in Semarang.[15]

Despite of that, Mays et al revealed that exposure of active parental smoking was related to offspring smoking habit, and the effect increases with longer exposure.[16] However, Resen elucidated that social environment had a higher impact than parental smoking.[10]

This study found no correlation between age and BMI with the level of nicotine dependence. However, several studies stated that there is a relationship between age and the level of nicotine dependence (Fagerstorm questionnaire).[17,18] Study by Li et al there was an inverse U-shaped relationship where middle-aged smokers (45-64 years) had higher level of nicotine dependence than those of young age (<45 years) and old age (≥65 years).[17] In addition, Park et

al found that the peak age to have a significant highest level of nicotine dependence was 50 years.[18]

Our study did not find a significant correlation between academic major and family smoking habits with the level of nicotine dependence. Binita et al stated that the number of smokers in family was no related to one's smoking habits.[15] In contrast with this author, Mays et al showed that longer duration of exposure to smoking parents will increase likelihood the adolescents become regular smoking.[16] Gilman et al clarified that parental smoking is associated with risk of adolescents' smoking initiation.[19]

This study found that the level of smoking habit was correlated with the level of nicotine dependence. This is in accordance with the theory that nicotine causes dependence to smokers. Nicotine induces dopamine release from dopaminergic neuron in the ventral tegmental area and nucleus accumbens. Dopamine provides a reward sensation as calming and happy feeling.[20]

Nicotine augments glutamate release that induces dopamine release, and gamma-aminobutyric acid (GABA), which inhibit dopamine release. Prolonged exposure to nicotine will desensitize nicotinic acetylcholine receptors. As a result, the release of glutamate remains high, whereas the release of GABA decreases. Therefore, smokers who develop this effect will experience withdrawal symptoms when they give up smoking because of low nicotine level.[20]

This phenomena proves that the greater levels of smoking habit, the higher levels of nicotine dependence. This is consistent with previous study by Lamin et al that found significant correlation between the levels of smoking habit and the levels of nicotine dependence.[13]

However, some limitations need to be acknowledged from this study. First that, this study only examine the effect of smoking habit to nicotine dependence without considering other confounding factors. Another, that recall bias might happen when the subjets fill out the questionnaire.

CONCLUSION

This study found that students' smoking habits were in mild level, whereas nicotine dependence was in low-moderate levels. There was a moderate correlation between smoking habit and nicotine dependence. Our subjects tend to have low levels of smoking habit and nicotine dependence. Therefore, it would be easier to educate them as early as possible to stop smoking. Educational and enganging smoking cessation campaign should be carried out earlier in students as it would be difficult to stop smoking when someone has smoked for a long time and develop nicotine dependence.

ACKNOWLOEDGMENT

The authors want to sincerely thank to Nathaniel Jason Zacharia, Karel Handito Syafi Sumarsudi, and Irfan Hasyim Tadjoedin for great team work, assistance

and support with this project. We also thank to students for kindly agreeing to participate in this study.

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