



## **Age at Smoking Onset, Nicotine Dependence And Their Association With Smoking Temptation Among Smokers**

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### **ABSTRACT**

*Age at starting smoking is one of the determinant factors of nicotine dependence levels and smoking temptation. This study was aimed to determine the age of smoking initiation and nicotine dependence and their association with smoking temptation in smokers. In this cross-sectional study, 642 smokers from two cities in Iran (Gorgan and Isfahan) were recruited by convenience sampling between the years 2012-13. Data collection methods included a demographic questionnaire, Fagerstrom nicotine dependency test and cigarette smoking craving situations questionnaire of Velicer et al. The average age at smoking onset was  $19.16 \pm 5.88$  years. There was a significant correlation between the age at smoking onset, nicotine dependency, cigarette craving and number of daily smoked cigarettes ( $p < 0.001$ ). The average scores of nicotine dependency test among those who had started smoking at the age of less than 16 years were significantly higher compared to those who started smoking at the age of 16 or older ( $p < 0.001$ ). There was a statistically significant difference between the average scores of smoking temptation and nicotine dependence levels ( $p < 0.001$ ). The results showed that, the lower the age at starting smoking is, the higher will be the level of nicotine dependence, cigarette craving, and number of daily consumed cigarettes. Therefore there is an essential need for specific treatment interventions for smoking cessation in people with high nicotine dependence and earlier smoking age of onset.*

**Keywords:** Smoking onset, Nicotine Dependence, Smoking Cessation, Smoking Temptation

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### **INTRODUCTION**

Tobacco consumption is considered as one of the contributory factors in increasing the overall burden of diseases which annually causes 4 million deaths around the world and reduces the average life expectancy up to 14 years [1]. Additionally, smoking has been identified as 9% of globally death [2]. Several studies have shown that the prevalence of smoking in both genders is growing worldwide, particularly among young individuals [3,4]. Epidemiological studies worldwide have demonstrated that smoking is highly associated with the incidence of non-communicable and chronic diseases such as cardiovascular disease, respiratory disease, cancer and stroke [5]. Cigarette mass production and

widespread publicity, has led to turn many individuals into smoking and caused an excessive increase in the number of smokers during the past decade [6].

According to World Health Organization (WHO) report in 2012, the prevalence of smoking in Iranian individuals aged 15-64 is up to 11.8 percent. This rate is 22.1 percent among men and 1.8 percent in women and the rate is rising [6]. Another study in Iran showed that the prevalence of smoking is 15.3 percent and 1.2 percent are passive smokers and the highest prevalence belongs to age groups of 35-64 years. Furthermore, its consumption in men is higher than women and the average number of cigarette consumption is 14.69 cigarettes per day [7].

Majority of smokers from all over the world tend to quit smoking. In the United States, 70% of smokers have tried to quit smoking for at least once and nearly 41 percent have tried to do so over the past year [8]. However, only approximately 7 percent of them have been able to quit smoking for a year (9). Despite the development of strategies to quit smoking, long term success rate is not high [10,11]. In a study conducted in Iran, only 2.7 percent were able to quit smoking [7].

Smoking cessation behavior is a multidimensional problem and its predictor variables are divided into several major categories including personal and demographic background, social and family background, psychological and pathophysiologic background. Meanwhile, the age at smoking onset as an individual and demographic variable and nicotine dependence as the underlying pathophysiologic background are considered as the main factors in prediction of success in smoking cessation [12].

Early age of initiating cigarette smoking is associated with long-term smoking, higher use and high nicotine dependence [13, 14]. Tayloi and Winder results showed that those who had started smoking before the age of 14, compared to those who had started smoking after the age of 20 are more prone to become heavy smokers [14]. Results of Hymowitz et al study on 13,415 smokers showed that initiating cigarette smoking after the age 20 is the most important predictor variable of smoking cessation success [15]. It was also revealed that cigarette smoking at a younger age can have harmful effects on brain development and cause higher brain nicotine dependency [12].

The intensity of nicotine dependence is also considered as another strong predictor of smoking, since induction of nicotine withdrawal symptoms lead to cigarette craving or temptation. Generally, the severity of nicotine dependence is measured by Fagerstrom nicotine dependence test which includes 6 simple questions and the score range of 0-10. The closer the score is to 10, the higher is the person's nicotine dependency [16]. Moreover, at the time of cessation, high nicotine dependency increases the need of treatment with high doses of replacement nicotine [17,18]. The results of studies have shown that people with scores of 7 or higher in the Fagerstrom test compared to other smokers, have experienced more severe symptoms of nicotine deprivation and may fail in their efforts to quit smoking [12,19,20].

Aryanpour and colleagues concluded that high nicotine dependency is associated with less success rate in smoking cessation [21] and on the other hand, another study showed that high nicotine dependency increases the motivation and thought of smoking cessation [22].

Therefore it seems that early initiation of cigarette smoking by increasing nicotine dependency will increase cigarette craving and thus reduces the rate of success in smoking cessation. Based on our literature review, few studies have been conducted in Iran about the age variables in smoking initiation, nicotine dependence and their association with smoking temptation. The aim of this study was to determine the age of smoking initiation and nicotine dependence and their association to cigarette smoking temptation in smokers.

## MATERIAL AND METHOD

### *Samples*

Participants in the study are 642 smokers from Isfahan and Gorgan, Iran. Their age range was 16-80 years with a mean standard deviation ( $\pm$  SD) of  $33.27 \pm 11.90$  years and the average age at smoking onset was  $19.16 \pm 5.88$  years, who smoked an average of  $15.04$  (S.D=10.30) cigarettes per day.

### *Measures*

In order to measure the amount of nicotine dependence, Fagerstrom test for nicotine dependency (FTND) was used [16].

According to this test, those who smoke their first cigarette, 5 minutes after waking up are given the score of 3, after 6-30 minutes score of 2, 31-60 minutes later are given the score of one and finally those who smoke after 60 minutes are given Zero. For those who smoked tobaccos in prohibited places were given one score and for the rest, the score was zero. Those who had trouble quitting the first cigarette smoking in the morning were given 1 score and those who had trouble quitting the rest of the times, received the score of zero. Those who smoked more cigarettes in the early morning compared to rest of the day were given score of one and others were given 2 scores. In case of severe illness so that individuals should be in bed for most of the day, if the person smokes, the score of 1 was given, otherwise the score was zero. The

score range was from zero to 10 (16). The reliability and validity of the used questionnaire have been approved in studies of Ziaoddin *et al.* [23] and Heydari *et al.* [24].

Specificity and sensitivity of the Fagerstrom test were 67.5 and 76.2 percent respectively [25]. In this study, those with a score of 7 or higher were considered as people with severe nicotine dependence, score of 4-6 as moderate and score of 3 or less were considered as mild nicotine dependence (16). Also the variable of age at the time of starting smoking in the analysis was put into two groups: under 16 years and 16 years and above.

To measure the temptation, the short-form of Velicer and colleagues questionnaire [26] was used which included 9 questions regarding the tempting situations for smoking. Answers to the questions were in the form of Likert-type scale with five responses of "Not at all" to "very high" and a score of 1 to 5 was assigned for each of them. Then the total score was divided by the number of questions and then the score of each individual was calculated between a minimum of 1 and a maximum of 5, accordingly.

Reliability and validity of the mentioned questionnaire was approved in a previous study [27].

#### Procedure

This cross-sectional study with a descriptive and analytical approach was conducted between 2012 and 2013 using convenience sampling. This study is the result of integrating two separate studies regarding smoking, according to the variables of trans-theoretical model that are approved by the University of Medical Sciences, Isfahan & Gorgan, Iran. In this analysis, age at starting smoking, nicotine dependence and cigarette craving and their association with smoking were assessed. The questionnaires were completed at the presence of questioners with oral consent of the participants. They were assured that their responses will be kept confidential and only used for research purposes. Inclusion criteria were people who were smokers at the time of the study and were taking at least one cigarette per day [28].

#### Analysis

Descriptive data analysis (frequency distribution, mean and standard deviation) was performed using the statistical software SPSS version 17. Based on the Shapiro-Wilk test, since the quantitative data were non-normally distributed, Mann-Whitney test was used in order to assess the relationship between age groups of smoking initiation and smoking temptation variables. Kruskal-Wallis test was used to assess the association between cigarette smoking craving and three grouped nicotine dependence. Moreover, to assess the correlation between the studied variables, Spearman rank correlation coefficient was used. Alpha level set at 0.05.

## RESULTS

The average of FTND was 3.77(S.D= 2.70) and the mean score for smoking temptation was 3.40(S.D=0.77). Of the studied population, 164 subjects (25.5 %) had started smoking before the age of 16 and the rest at age of 16 or older. Moreover, 336 individuals (52.4 %) had mild nicotine dependence, 185 (28.8%) had moderate dependence and the remainder (18.8 %) had high nicotine dependence.

The Spearman correlation test results showed that there was a significant correlation between the age at starting smoking, nicotine dependence and cigarette smoking craving and the number of daily consumed cigarettes (Table 1). The average scores of nicotine dependence in those who had started smoking at the age of less than 16 was 4.52 and in people who had started smoking after the age of 16 was 3.51 ( $p<0.001$ ). Besides, The mean scores of smoking temptation among subjects who had started smoking at the age of less than 16 was 3.51 and in rest of the groups was 3.36. These differences were statistically significant based on the results of the Mann-Whitney test ( $P<0.036$ ). Kruskal-Wallis test results showed that there is a statistical correlation between the average scores of cigarette smoking temptation and nicotine dependence levels (Table 2).

Table 1: Correlation among age at smoking initiation, nicotine dependency, temptation, and number of daily consumed cigarettes

	1	2	3	4
1.age at smoking onset	1.00	0.165*	-0.133*	-0.152*
2.nicotine dependency			0.443*	0.670*
3.temptation				0.284*
4.Daily smoking				

\* Correlation is significant at the 0.001 level (2-tailed)

Table 2. Mean and S.D of temptation scores in three levels of nicotine dependency

Nicotine dependency	Mean (S.D)	X <sup>2</sup>	P-value
Low dependence	3.11 (0.74)	103.569	<0.0001
Middle dependence	3.60 (0.64)		
High Dependence	3.88 (0.67)		

## DISCUSSION

The results showed that the early age of smoking initiation, nicotine dependence and cigarette craving and increase in smoking are all correlated. The entire mentioned factors, increase smoking cessation failure rates.

Result of Breslau and Peterson [13], Khuder and colleagues [29] and Lando et al. [30] showed that those who had started smoking at a younger age due to greater nicotine dependence and cigarette craving had experienced more failure compared to those who had started smoking at older ages.

The results also showed that, increase in the amount of nicotine dependence and cigarette craving, increases the number of daily consumed cigarettes by smokers. However, according to the "Hardening Hypothesis", in countries such as Sweden and the United States because of the "anti-smoking climate" in recent decades, the prevalence of smoking has notably declined and reached a constant level. Based on the evidences and experimental observations, the remaining smokers had failed to cease smoking due to their intense nicotine dependence and cannot easily quit smoking [31,32]. The results of Irvin and Brandon indicated that smoking rates in the United States has declined in recent years and concluded that due to their high dependency, helping the remaining smokers in smoking cessation has become a challenging issue [33].

Fagerstrom & Furberg results indicated that the prevalence of smoking in Norway and Germany are much higher than the US and Sweden, but the amount of nicotine dependence in smokers in the said countries are notably higher than Norway and Germany, therefore smoking cessation still remains a difficulty for the mentioned smokers. Furthermore, smokers in Norway and Germany can easily quit smoking due to their mild nicotine dependence but the remaining smokers in countries such as the US and Sweden need therapeutic interventions in order to successfully quit smoking [34].

The findings also showed that nicotine dependence is higher in subjects who had started smoking at younger ages. The results of Khuder and colleagues also revealed that the failure rate of cigarette smoking in those who started smoking at age of less than 16 were 2.1 times more than individuals who started smoking later [29]. The results of other studies also showed that the younger age of starting smoking is directly associated with higher nicotine dependence [13,19,20].

The results of Islami et al. also showed that the amount of nicotine dependence in those who had started smoking at the age of 20 and younger was higher compared to those who had begun to smoke at 20 and older [35].

The results of this study confirm that people with severe dependence are more tempted than other smokers which is obvious, as it is expected that the severity of nicotine withdrawal symptoms will be higher in nicotine dependent individuals, thus increases their desire and temptation of smoking which leads to difficulty and failure to quit smoking. The results of Aryanpour and colleagues showed that the success rate of smoking cessation in people with high and low nicotine dependency is 59.4 and 70.5 % respectively [21].

Cross- sectional nature of this study and lack of biochemical assessment of nicotine metabolites to measure nicotine dependence are some of the limitations in this study that should be considered in generalization of the results. Conducting prospective design, biochemical verification of the nicotine dependency, and replicating of the current findings in future study should be included.

## CONCLUSION

This study demonstrated that smoking onset at an early age increases nicotine dependence of the individuals, their temptation of smoking and the number of daily consumed cigarettes. Specific treatment interventions for smoking cessation in people with early age initiation of smoking and high nicotine dependency are essential.

## COMPETING INTERESTS

The authors declare that they have no competing interests.

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