ASSESSMENT OF SMOKING IN ADOLESCENTS – A SAMPLE FROM VOCATIONAL EDUCATION CENTRE

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SUMMARY

Objective: The aim of this study was to analyse the knowledge and attitudes about smoking in young people between 16–20 years of age, who were both working and attending the Vocational Education Centre.

Methods: This study was conducted with high school students at the Vocational Education Centre. The socio-demographic questionnaire and the Fagerström Test of Nicotine Dependence (FTND) were applied to the students using a face-to-face interview technique. Secondly, interactive educations on smoking-free life and smoking-related diseases were given. At last, CO (carbon monoxide) levels and respiratory functions were evaluated.

Results: Of the students 92.9% were males, 37.4% were 16 years, 35.8% were 17 years and 26.9% were 18–20 years old. Among 46.9% of smokers, 75.8% started smoking before 15 years of age, 86.1% were living with smokers. While 70.5% of smokers smoked more than 10 cigarettes daily, 61.3% smoked their first cigarette in the first half hour after waking up. Of the smokers, 28.8% were highly dependent, 13.0% were very highly dependent. CO levels were significantly higher in those who smoked in the workplace, who smoked mostly in the morning time, and those who started smoking at 7 years of age and younger (p < 0.05). FEV1, FVC, FEF25–75 values of morning smokers were significantly lower (p < 0.05).

Conclusion: Unfortunately, the first smoking age was very low, the first cigarette of the day was lit in a short time after waking up, and family/friend's attitudes and behaviours were encouraging in this age group. More attention should be paid to this issue and especially new preventive projects should be implemented to protect young people from smoking.

INTRODUCTION

Smoking is a significant public health issue (1, 2). More than seven million tobacco-related deaths occur worldwide every year, whereas more than 8 million deaths are associated with tobacco smoke (3). Smoking may lead to many preventable diseases and is the leading cause of preventable deaths (4, 5). Therefore, precautions taken in the war against tobacco use are valuable.

Considerable progress has been achieved on tobacco control since the mid-1980s in Turkey, and the Framework Convention on Tobacco Control (FCTC) of the World Health Organization (WHO) has been signed by Turkey (6). Turkey is the first country that implemented at the highest level all strategies included in the M-POWER policy package proposed by the WHO to control tobacco use (7). Besides, youth smoking is one of the most important considerations. Globally, it is estimated that 25 million male and 13 million female adolescents aged between 13 and 15 years use tobacco or smokeless tobacco products (8). Based on WHO estimates for trends among young people, the prevalence of smoking among young people in Turkey in 2003, 2009, and 2012 were 9.8%, 11% and 17.3% in males, and 3.7%, 5.6% and 9.7% in females, respectively. The increases in the prevalence of smoking among young people further support that there is a requirement for fighting tobacco smoking in public health (9).

This study aimed to analyse knowledge and attitude about smoking in 16–20 years old teenagers working in different branches and attending the Vocational Education Centre. The study was designed to analyse possible associations between socio-demographic characteristics and smoking patterns in young people by performing pulmonary function tests (PFTs) and CO (carbon monoxide) measurements in smokers.

MATERIALS AND METHODS

This cross-sectional study was conducted between September 2016 and February 2017 in high school students who received training once a week in the Vocational Education Centre of Konya City. Among Turkish cities, Konya ranks seventh by population, and a relatively higher number of students attend vocational schools. The sample size was not calculated, and the study intended to include all students who agreed to participate in the

study. In light of medical literature, investigators have prepared a questionnaire that included items addressing socio-demographic characteristics, knowledge about smoking, and attitude towards smoking. Besides, training presentations about passive smoking, nicotine dependency, hazards of smoking, and ways of quitting were prepared using interactive techniques such as questions and answers, role-play or brainstorms. Local Ethics Committee approval (Decision No.2016/558) and relevant agency approval were obtained. Teachers were informed about the study one week before the initiation of the study. Parent information forms were submitted to teachers to convey to students' parents, and students who were not willing to participate in the study were asked to provide written feedback to the teachers.

The study was designed to include three phases. In the first phase, students who were willing to participate in the study and whose families allowed their participation received the questionnaire specifically designed for the study and the Fagerström Test of Nicotine Dependence (FTND) during face-to-face interviews. FTDN is the most commonly used test to assess tobacco dependence. Fagerström first proposed it as FTND in 1978, and the current version referred to as FTND was revised by Heatherton et al. (10). The validity and reliability study of FTND was conducted by Uysal et al. and was found to be moderately reliable (11). FTND scores from 0 to 2 indicate very low nicotine dependence, scores 3 to 4 indicate low nicotine dependence, scores of 5 indicate moderate dependence, scores from 6 to 7 indicate high dependence, and scores 8 to 10 indicate very high nicotine dependence (12).

The second phase started after administering the questionnaire and included interactive training sessions with the active participation of the National Education Directorate's directors involving smoking-free life and smoking-related diseases. In the third phase, smoker subjects were informed about how CO in the breath would be measured, and in those who agreed to undergo the test, CO in exhaled breath was measured by a carbon monoxide monitor (Compact Smokerlyzer Breath Carbon Monoxide Tester – Bedfont Scientific Ltd.) using disposable mouthpieces (in ppm) (13). Smoker students were invited to the clinic to undergo pulmonary function tests, to receive counselling for tobacco cessation and long-term follow-up. Pulmonary function tests were performed with MIR SpirolapIII colour device by a single technician. The best test among the consecutive three tests was accepted. Forced expiratory volume (FEV1), forced vital capacity (FVC), FEV1/FVC (%), forced expiratory volume between 25–75% of vital capacity (FEF25–75, %) were measured according to the American Thoracic Society criteria (14).

Descriptive characteristics of data were summarized as numbers and percentages. The Chi-square test (χ^2) was used to compare categorical variables and the Mann-Whitney U and Kruskal-Wallis tests followed by Dunn multiple comparison posthoc were used to compare continuous variables between independent groups. A p-value less than 0.05 was considered statistically significant.

RESULTS

Socio-demographic Characteristics

Out of 953 students (participation rate 93%) who agreed to fill in the questionnaire, 92.9% were males and 64.7% were living in a nuclear family. The 16-year-old age group accounted for 37.4% of students, the 17-year-old age group accounted for 35.8%, and the 18 to 20-year-old age group accounted for 26.9%. A chronic health condition was not reported in 96.6% of participants; 59.8% of mothers and 53.4% of fathers were primary school graduates, whereas 0.9% of mothers and 2.7% of fathers were university graduates.

Career Fields and Reasons for Career Election

At the time of their participation in the study, participants were working in various sectors including offset printing, furniture manufacturing, car bodywork repairing, welding, hydraulics, tire making, upholstery, LPG, vehicle maintenance and repair, car painting, lathe machine repairing, exhaust pipe repairing, aluminium joinery, woodworking, machine manufacturing, glass balcony, plastic molding, as well as business fields such as male and female hairdressing and pastry. The reason for electing to study while working was "of their own-choice" in 72.3% of the participants, 10.6% reported that they elected working while studying due to financial reasons, 5% said that their family requested it, 5.5% reported various reasons for studying while working, and 6.6% of participants left blank this item.

Smoking in Their Entourage and Smoking Areas

Participants reported that there were smokers among their teachers (74.6%), co-workers at their workplace (75.4%), or at home where they lived (86.1%). Students reported that they mainly smoked in "outdoor areas" of their workplace (43%), and those who smoked at home reported that they smoked in all units of their home, and the most common smoking location was the balcony (51.8%). The smoking status of participants did not vary according to the maternal educational attainment (p > 0.05), whereas the prevalence of smoking decreased among the students as the paternal educational attainment increased (p < 0.05) (Table 1).

Smoking Status

Of participants, 46.9% reported that they smoked. Of smokers, 70.5% reported that they smoked more than ten cigarettes per day and 61.3% reported that they had their first cigarette of the day within a half-hour after waking up (Table 2). No associations were found between the age at the onset of smoking and maternal or paternal educational attainment (p > 0.05). The age at the onset of smoking had no effects on their motivation for quitting smoking and their belief in their quitting success in this study (p > 0.05). Smoking rates were 44.1% in women, 47.1% in men.

Knowledge-Attitude towards Smoking

"Lung cancer" ranked first among students' responses to the question "What are the diseases caused by smoking?" with 68.9%; 50.8% of participants believed that sellers did not comply with the law prohibiting cigarette sales to minors less than 18 years of age. Although there is a ban on smoking in indoor areas, 58.2% of participants believed that this law was violated (Table 3). When we asked "What other measures do you think should be taken for

Table 1. Characteristics of participants (N = 953)

Variables		Smoking n (%)	Not smoking n (%)	x^2	p-value
Gender	Male	417 (93.3)	468 (92.5)	0.228	0.633
	Female	30 (6.7)	38 (7.5)		
Family type	Nuclear	298 (66.7)	319 (63.0)	1.548	0.461
	Large	80 (17.9)	96 (19.0)		
	Other	69 (15.4)	91 (18.0)		
Mother's education level	Primary school	273 (61.1)	297 (58.7)	2.747	0.253
	Middle school	141 (31.5)	181 (35.8)		
	High school and above	33 (7.4)	28 (5.5)		
Father's education level	Primary school	224 (50.1)	285 (56.3)	4.826	0.090
	Middle school	166 (37.1)	174 (34.4)		
	High school and above	57 (12.8)	47 (9.3)		
Mother's smoking status	Smoking	26 (10.7)	21 (7.6)	1.504	0.220
	Not smoking	216 (89.3)	254 (92.4)		
Father's smoking status	Smoking	164 (66.9)	156 (54.5)	8.464	0.004*
	Not smoking	81 (33.1)	130 (45.5)		

*Indicates statistical difference

a smoke free society", 11.4% reported that one should not smoke in front of the school gate, in particular.

Fagerström Test of Nicotine Dependence

Of participants, 28.8% were highly dependent, and 13.0% of participants were very highly dependent (Table 3). The Fagerström dependency scores did not differ significantly by age, sex, or family type ($p > 0.05$). The FTND scores of those who started smoking at the age of seven or younger were significantly higher than those who started smoking at all other ages, and there was a statistically significant difference between the 8 and 12 age groups and the 16–18 age group ($p = 0.001$) (Table 4).

Significant associations were found between the FTND scores and the number of cigarettes smoked per day and smoking duration (years) ($p = 0.001$). Participants who were willing to quit smoking and those who believed that they could quit had significantly lower FTND scores ($p = 0.02$, $p < 0.001$) (Table 4).

CO Measurements

Workplace smoking, higher numbers of cigarettes smoked in the morning, and starting smoking at age seven or younger were associated with significantly higher CO levels in exhaled breath ($p < 0.05$). Significant differences were found between dependency groups and the level of CO in exhaled breath (Table 5).

Pulmonary Function Tests

FEV1, FVC, FEF25–75 were significantly lower in those who smoked more cigarettes in the morning than the rest of the day ($p < 0.05$). FEF25–75 was significantly lower in participants who were working in workplaces where smoking was allowed compared to the participants who worked in smoke-free workplaces and in participants who had started smoking at age seven or younger or between 8 and 12 years of age compared to participants who had started at a later age ($p < 0.05$) (Table 6). FVC measurements in female participants were significantly higher than those in male participants ($p < 0.05$), whereas FEV1 and FEF25–75 did not differ by sex ($p > 0.05$), FEV1, FVC, FEF25–75 values did not differ by the age groups or nicotine content of cigarettes ($p > 0.05$).

DISCUSSION

Women and youngsters have recently become the tobacco industry's target (15, 16). Smoking rates among adolescents cannot be ignored in developing countries such as Turkey (17). Our study is one of the limited studies assessing nicotine dependence and CO and PFT measurements in adolescents working while studying and is expected to shed light on this area.

Almost half of the Vocational Education Centre students participating in our study reported that they were smokers. Various studies reported different smoking rates among young people in our country; 47% (high school students) and 67.5% (their peers, working but not studying adolescents) (18), 31.3% (students working while studying) (19), and 34% (adolescents) (17).

Smoking rates varied from 12.8% to 48.5% among adolescents in various studies conducted in other countries (21–24). Considering these rates, smoking is an important issue not only in our country but also around the world.

In a study conducted by Alkaç et al., a significant association was found between higher parental education levels and fewer smoking attempts (25). In our study, although the prevalence of smoking reduced as the paternal educational attainment increased ($p > 0.05$), the parents' educational level did not affect the age at smoking onset.

An alarming observation in our study was that three-quarters of participants had started smoking under sixteen. The presence of participants who had started smoking even before seven was

Table 2. *Characteristics of smoking participants (n = 447)*

Variables		n (%)
Age at the onset of smoking	7 years or younger	39 (8.7)
	8–12 years	107 (23.9)
	13–15 years	193 (43.2)
	16–18 years	108 (24.2)
Number of cigarettes smoked per day	≤ 10	132 (29.5)
	11–20	192 (43.0)
	21–30	75 (16.8)
	≥ 31	48 (10.7)
Smoking duration (years)	< 1 year	45 (10.1)
	1–3 years	138 (30.9)
	3–5 years	121 (27.0)
	5–7 years	83 (18.6)
	7–10 years	60 (13.4)
Time to smoke the first cigarette of the day after waking up	Within 5 minutes	126 (28.2)
	6–30 minutes	148 (33.1)
	31–60 minutes	62 (13.9)
	More than 60 minutes	111 (24.8)
Time of the day when they smoke most intensely	Mostly in the morning	235 (52.6)
	Other times of the day	212 (47.4)
Breathing in cigarette smoke	Never	43 (9.6)
	Occasionally	60 (13.4)
	Always	344 (77.0)
Information about the nicotine content of the cigarette that she/he smoke	I have no idea	164 (36.6)
	More than 1.0 mg	101 (22.6)
	0.61 to 1 mg	112 (25.1)
	0.6 mg or less	70 (15.7)
Actual reason for smoking	Boredom	139 (31.1)
	To believe that it has a calming effect	128 (28.6)
	Its potential to make forget problems momentarily	64 (14.3)
	To appear cool to friends	31 (6.9)
	To believe that smoking is an indicator of power	19 (4.3)
	Other	66 (14.8)
Desire to quit smoking	I am not willing to quit	226 (50.6)
	I am willing to quit	143 (32.0)
	Unanswered	78 (17.4)
Previous attempts to quit smoking	No, I did not make any attempt	226 (50.6)
	Yes, I attempted to quit	221 (49.4)
Believing in their quitting success	No, I cannot	189 (42.3)
	Yes, I can	162 (36.2)
	Unanswered	96 (21.5)

further worrisome. In a study conducted by Özkaya and Arıca on college students, the mean age of smoking initiation was 15.9 ± 2.66 years of age, with the youngest age of initiation 12 years and the oldest age 27 years (26). The smoking initiation rate under 15 years in the general population was reported to be 15% in the most recent update of the Turkey Global Adult Tobacco Survey in 2016 (27). The rate of smokers who had their first cigarette of the day within a half-hour after waking up was 61.3% in our study. In the report of the Global Adult Tobacco Survey in 2016, this rate was 21% in the general population (27). The higher percentage in our study may be related to the single-centre design of this study conducted in the students of the Vocational Education Centre.

Table 3. *Participants' knowledge on smoking and their attitude towards smoking (N = 953), and FNTD scores of smokers*

Questions	Variables	n (%)
Diseases caused by smoking[a]	Lung Cancer	657 (68.9)
	Cardiovascular diseases	351 (36.8)
	Larynx cancers	350 (36.7)
	Cancers of the mouth	215 (22.6)
	Newborn deaths	146 (15.3)
	Cerebrovascular diseases	138 (14.5)
	Chronic bronchitis	114 (12.0)
	Bladder cancer	83 (8.7)
Ban on cigarette sales to minors less than 18 years of age	The law is not complied with	484 (50.8)
	The law is partially applied	285 (29.9)
	The law is strictly applied	111 (11.6)
	Unanswered	73 (7.7)
Effects of health warning labels on cigarette packages	Ineffective	745 (78.2)
	Effective	126 (13.2)
	Unanswered	82 (8.6)
Noticeability of cigarette display stands in shops	Immediately draw my attention	484 (50.8)
	Do not draw my attention	394 (41.3)
	Unanswered	75 (7.9)
Compliance with the ban on smoking in indoor areas	No, it is not complied with	555 (58.2)
	Yes, it is complied with	224 (23.5)
	Unanswered	174 (18.3)
Passive smoking[a]	Impassivity of people who does not smoke or who are affected by second-hand smoke	271 (28.4)
	The rate of smokers in the society is so high that it cannot be ignored	224 (23.5)
	It appears ordinary in everyday life	219 (23.0)
	Persons or institutions responsible for implementing the ban usually do not undertake their responsibility	177 (18.6)
	Unanswered	116 (12.2)
Dependence level based on FTND scoring (N = 447)	Very low (0–2)	101 (22.6)
	Low (3–4)	101 (22.6)
	Moderate (5)	58 (13.0)
	High (6–7)	129 (28.8)
	Very high (8–10)	58 (13.0)

[a]More than one answer was given; FTND – Fagerström Test of Nicotine Dependence

The rate of participants smoking more than ten cigarettes per day was found to be high in our study. In the study conducted by Özkaya and Arıca, the number of cigarettes smoked per day was ≤10 in 50.8% of students, 11–20 in 31.7%, 21–30 in 14.3%, and ≥31 in 3.2% of students (26). In another study conducted in the Vocational Education Centre, the number of cigarettes smoked per day was ≤10 in 20% of students, 11–20 in 20%, 21–30 in 4.7%, and ≥31 in 2.7% of students (28). The number of cigarettes smoked per day in our study group was higher than those in other studies in the literature.

Three-quarters of students stated that there were smokers among their teachers as well as among their friends. The rates were even higher for the presence of smokers in the family. In parallel with our study, Ertaş reported that smokers' presence among parents, teachers and peers was found to be a significant risk factor that might encourage starting and carrying on smoking (29).

In our study, the Fagerström dependence scores did not differ significantly across age, sex, family type, and class groups. In a study conducted in smoker students, Alikasifoglu et al. reported that dependence levels varied by sex (20). In a study conducted in 2012, Kaptanoğlu et al. detected a positive correlation between the level of dependence and age, and reported that the level of nicotine dependence increased as the age increased (30). This finding may suggest that the fight against this habit may become more challenging in older ages. Unlike our study, nicotine dependence levels have differed significantly by specific socio-demographic characteristics in other studies in the literature.

In our study, participants who had started smoking at age seven or younger or between 8 and 12 years of age had significantly higher FTND scores compared to those who had started smoking in older ages. In another study conducted among high school students living in Istanbul, Alikasifoglu et al. reported that

Table 4. Associations between level of tobacco dependence and smoking history based on Fagerström dependence scores

Variables		Median (min–max)	KW-MWU/p-value	Post hoc[a]
Age at smoking initiation	7 years or younger[1]	7 (0–10)	37.698/0.001*	1–2 2–4
	8–12 years[2]	5 (0–10)		
	13–15 years[3]	4 (0–10)		
	16–18 years[4]	4 (0–10)		
Number of cigarettes smoked per day	≤ 10[1]	2 (0–7)	232.111/0.001*	1–2 2–3
	11–20[2]	5 (1–8)		
	21–30[3]	7 (3–9)		
	≥ 31[4]	8 (3–10)		
Smoking duration (years)	< 1 year[1]	2 (0–9)	59.969/0.001*	1–3 2–3
	1–3 years[2]	4 (0–9)		
	3–5 years[3]	5 (0–10)		
	5–7 years[4]	6 (0–10)		
	7–10 years[5]	6 (0–10)		
Desire to quit	Yes	4 (0–10)	21924.5/0.025*	
	No	5 (0–10)		
Attempt to quit	Yes	4 (0–10)	22324.5/0.051	
	No	5 (0–10)		
Belief in their quitting success	Yes	4 (0–10)	10442.5/< 0.001*	
	No	6 (0–10)		

*Statistically significant difference; MWU – Mann-Whitney U test; KW – Kruskal-Wallis; [a]Dunn's multiple comparison post hoc

smoking gradually increased by grade level (20). These findings may suggest that smoking initiation in childhood or younger ages may be associated with higher addiction levels.

In our study, dependence scores significantly increased as the number of cigarettes smoked per day and smoking duration (years) increased. Ozkaya and Arıca reported that 44.4% of the students were very mildly dependent (26). In line with other studies in the literature, nicotine dependence increased with the number of cigarettes smoked per day and smoking duration in our study (31).

The Fagerström Dependence levels were significantly lower in students who were willing to quit smoking and those who believed that they could quit in our study. In their study, Warren et al. also detected lower levels of dependence in those who were willing to quit smoking and those who believed they would successfully quit (32). In line with the literature, our study showed that participants who had lower nicotine dependence exhibited a stronger desire to quit smoking and were more confident that they could quit smoking.

FEV1, FVC, and FEF25–75 did not differ significantly by age in our study. However, unlike our study, Islam et al. demonstrated a negative correlation between age and FEV1, FVC, and FEF25–75 (33). Besides, FVC values were significantly higher in female participants than male participants in our study, FEV and FEF25–75 did not differ significantly by sex. In a study conducted in female and male students aged 10–15 years, Yurduseven et al. reported higher FEV1 and FVC in male students compared to female students (34). A review of various studies in the literature indicated that pulmonary function tests could vary by sex, in general (35).

In our study, FEV1 and FVC were significantly lower in participants who had a history of smoking duration longer than one year compared to participants who had a history of smoking duration of less than one year. Furthermore, FEF25–75 was also significantly lower in participants who had a history of longer smoking duration compared to those who had a history of smoking duration of less than one year, 1–3 years, and 3–5 years. FEV1, FVC, and FEF25–75 were significantly lower in heavy smokers compared to those who smoked less than ten cigarettes per day or 11–20 cigarettes per day. Boskabady et al. reported significant decreases in FEV1/FVC and FEF25–75 in deep inspiration and normal inspiration smokers, and also reported inverse correlations with PFT values and total smoking time and amount (36). In a study conducted by Urrutia et al. (37), significant differences were detected between non-smokers and study subjects smoking more than 20 cigarettes per day in FEV1 and FEV1/FVC. Prokhorov et al. (38) have reported significant reductions in FEV1 and FEF25–75 values in individuals smoking more than 20 cigarettes per day compared to individuals smoking less than 20 cigarettes. In a study conducted by Jawed et al., FEV1 was significantly lower in subjects smoking ≥10 cigarettes per day compared to those smoking <10 cigarettes per day (39). In line with the literature FEV, FVC and FEF25–75 significantly decreased as the smoking duration and the number of cigarettes smoked per day increased in our study.

FEV1 and FVC were significantly lower in the group of participants defined as highly dependent by the FTND scores compared to other groups. Paired comparisons across low, moderate and high dependence groups revealed significant differences in FEF25–75 measurements. In another study, Demirbaş and Kutlu did not detect any correlations between the dependence level and FEV1 or FVC (40). FEF25–75 was significantly lower in participants who reported that they "always breathed in cigarette smoke" compared to those who declared that they "occasionally breathed in it."

Table 5. *Changes in CO levels in exhaled breath by certain variables*

		Median (min–max)	MWU-KW/p-value	Post hoc[a]
Smoking in the workplace	Yes	14 (4–27)	13400.0/0.001*	
	No	11 (5–24)		
Time of the day when they smoke most intensely	Morning	15 (6–27)	15116.5/<0.001*	
	Other	11 (4–24)		
Age at smoking initiation	7 years or younger[1]	17 (6–24)	12.985/0.005*	1–3
	8–12 years[2]	13 (6–25)		
	13–15 years[3]	13 (4–25)		
	16–18 years[4]	11 (6–27)		
Number of cigarettes smoked per day	≤ 10[1]	9 (5–22)	127.475/<0.001*	1–2 2–3
	11–20[2]	13 (6–25)		
	21–30[3]	17 (7–27)		
	≥ 31[4]	17 (4–25)		
Smoking duration (years)	< 1 year[1]	9 (7–19)	43.362/<0.001*	1–2 2–4
	1–3 years[2]	12 (5–24)		
	3–5 years[3]	14 (6–27)		
	5–7 years[4]	15 (6–24)		
	7–10 years[5]	15.5 (4–25)		
Breathing in cigarette smoke	Never[1]	13 (6–27)	11.501/0.003*	2–3
	Occasionally[2]	10 (7–24)		
	Always[3]	13 (4–25)		
FTND level	Very low (0–2)[1]	9 (5–19)	270.692/<0.001*	1–3 2–3 3–4
	Low (3–4)[2]	10 (6–24)		
	Moderate (5)[3]	12 (4–25)		
	High (6–7)[4]	16 (11–27)		
	Very high (8–10)[5]	20 (14–25)		

*Statistically significant difference; MWU – Mann-Whitney U test; KW – Kruskal-Wallis; [a]Dunn's multiple comparison post hoc

Furthermore, CO levels in exhaled breath significantly increased as the number of cigarettes smoked per day and smoking duration (years) increased. In line with our study, CO levels in exhaled breath were found to increase as the number of cigarettes smoked per day and smoking duration (years) significantly increased in a study conducted by Bulut et al. (41). CO levels in exhaled breath were also elevated in participants who declared that they always breathed in cigarette smoke compared to those who occasionally breathed in cigarette smoke. CO levels in exhaled breath did not differ significantly by the nicotine content of cigarettes smoked by participants.

In our study, CO levels in exhaled breath varied in parallel with the participant's nicotine dependence. In a study conducted in adult male and female participants, Sönmez et al. reported a statistically significant positive correlation between CO levels and the Fagerström dependence scores (42). The level of CO in exhaled breath may be a guiding factor in determining the severity of nicotine dependence.

More than half of the participants in our study declared that they did not believe that the ban on smoking in indoor areas was adequately applied. In a study conducted by Özkaya and Arıca, the rate of individuals believing in the absolute necessity of a ban on smoking in indoor areas was 54.2% (26). Besides, 11.4% of our study participants have proposed to ban smoking at school

gates to achieve a tobacco-free society. In a study conducted by Özkaya and Arıca, 44.4% of participants said that the expansion of a smoking ban might positively impact the prevention of second-hand smoking (26).

Limitation of the Study

The single-centre design of the study was the limitation of the study. Furthermore, the lack of information about parental smoking status might be a limitation.

CONCLUSION

Our study is one of the comprehensive studies assessing nicotine dependence and CO levels in exhaled breath and pulmonary function tests in a group of adolescents working while studying and providing education on the harmful effects of smoking.

Based on this study's results, the age at smoking initiation is very low, and parents' and entourage's attitude and behaviours may pose a risk for encouraging adolescents to smoke. Therefore, we believe that various smoking prevention projects should be implemented to attract public attention to this issue and prevent tobacco use, particularly among young people.

Table 6. *Changes in FEV1, FVC, FEF25–75 values in pulmonary function tests by certain variables*

	FEV1		FVC		FEF25–75	
	Median (min–max)	MWU-KW/p-value (post hoc)	Median (min–max)	MWU-KW/p-value (post hoc)	Median (min–max)	MWU-KW/p-value (post hoc)
Smoking in the workplace						
Yes	98.0 (11.0–21.0)	15590.07/0.180	102.0 (8.0–123.0)	15693.5/0.212	72.0 (39.0–100.0)	14730.0/**0.036***
No	98.0 (81.0–117.0)		102.0 (76.0–123.0)		74.5 (51.0–98.0)	
Time of the day when they smoke most intensely						
Morning	98.0 (73.0–21.0)	21532.5/**0.013***	101.0 (62.0–120.0)	21959.0/**0.030***	69.0 (41.0–98.0)	16574.5/**< 0.001***
Other	99.0 (11.0–18.0)		102.0 (8.0–123.0)		78.0 (39.0–100.0)	
Age at smoking initiation						
7 years and younger[1]	98.0 (76.0–14.0)	2.624/0.453	101.0 (67.0–119.0)	0.509/0.917	65.0 (43.0–98.0)	22.96/**< 0.001*** **(1–3)**** **(2–4)****
8–12 years[2]	98.0 (75.0–18.0)		102.0 (73.0–123.0)		71.0 (39.0–100.0)	
13–15 years[3]	98.0 (11.0–21.0)		102.0 (62.0–123.0)		74.0 (43.0–98.0)	
16–18 years[4]	99.0 (73.0–16.0)		102.0 (8.0–119.0)		77.0 (48.0–98.0)	
Number of cigarettes smoked per day						
≤ 10[1]	99.0 (79.0–17.0)	21.819/**< 0.001*** **(1–3)****	103.0 (75.0–123.0)	21.520/**< 0.001*** **(4–1)****	79.5 (54.0–98.0)	84.975/**< 0.001*** **(4–1)**** **(3–1)**** **(2–1)****
11–20[2]	98.0 (11.0–21.0)		102.0 (62.0–121.0)		72.0 (48.0–100.0)	
21–30[3]	97.0 (74.0–14.0)		99.0 (67.0–115.0)		68.0 (41.0–89.0)	
≥ 31[4]	96.0 (76.0–14.0)		99.0 (8.0–123.0)		66.5 (39.0–98.0)	
Smoking duration (years)						
< 1 year[1]	102.0 (79.0–6.0)	17.187/**0.002*** **(1–2)****	106.0 (83.0–119.0)	14.806/**0.005*** **(1–2)****	78.0 (49.0–98.0)	36.314/**< 0.001*** **(2–4)**** **(1–3)****
1–3 years[2]	98.0 (78.0–17.0)		102.0 (62.0–120.0)		77.0 (49.0–98.0)	
3–5 years[3]	98.0 (11.0–18.0)		100.0 (75.0–123.0)		72.0 (43.0–100.0)	
5–7 years[4]	98.0 (75.0–14.0)		99.0 (73.0–116.0)		69.0 (39.0–98.0)	
7–10 years[5]	98.0 (73.0–21.0)		102.0 (8.0–123.0)		68.5 (43.0–98.0)	
Breathing in cigarette smoke						
Never[1]	98.0 (74.0–10.0)	3.1447/0.208	102.0 (75.0–117.0)	1.062/0.588	72.0 (48.0–96.0)	8.807/**0.012*** **(2–3)****
Occasionally[2]	99.0 (79.0–14.0)		102.0 (76.0–123.0)		78.0 (51.0–98.0)	
Always[3]	98.0 (11.0–21.0)		102.0 (8.0–123.0)		71.0 (39.0–100.0)	
FTND level						
Very low (0–2)[1]	99.0 (111.0–117.0)	36.302/**< 0.001*** **(5–1)**** **(4–1)****	103.0 (76.0–123.0)	44.134/**< 0.001*** **(5–1)**** **(4–1)****	83.0 (54.0–98.0)	199.0.89/**< 0.001*** **(5–1)**** **(4–1)**** **(3–1)****
Low (3–4)[2]	99.0 (78.0–118.0)		103.0 (75.0–121.0)		79.0 (54.0–100.0)	
Moderate (5)[3]	99.0 (73.0–115.0)		103.0 (78.0–123.0)		74.5 (56.0–98.0)	
High (6–7)[4]	97.0 (74.0–121.0)		199.0 (62.0–115.0)		68.0 (41.0–98.0)	
Very high (8–10)[5]	92.5 (75.0–114.0)		94.0 (8.0–119.0)		61.0 (39.0–75.0)	

FEV1 – forced expiratory volume; FVC – forced vital capacity; FEV1/FVC (%), FEF25–75 – forced expiratory volume between 25–75% of vital capacity; *statistically significant difference; MWU – Mann-Whitney U test; KW – Kruskal-Wallis; **Dunn's multiple comparison post hoc

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