The Influence of Family Factors on Smoking Behavior in Turkey

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Abstract: *Aim*: The goal of this study is to specify the risks, family and environmental factors affecting smoking behavior and develop suggestions for Turkish individuals by considering sibling data.

Materials and Methods: The data was collected by voluntary senior year students attending Kırıkkale University, Department of Statistics. The sample of 751 families was selected from families with at least two children. Each sibling's socio-demographic information and behavioral phenotypes were collected using a survey from both siblings. We selected one of siblings randomly as 'sibling1' and defined the other sibling as 'sibling2'. Hypothesis testing and multivariable clustered logistic regression models were used to evaluate the data and find the optimum model by using dependent sibling data.

Results: Out of 1502 (751 pairs) siblings 843 (56.1%) were males, 659 (43.9%) were females. According to the survey results, 508 of the males (67.7%) and 242 of the females (32.3%) were smokers for a month or longer and smoked every day. The risk of smoking was 2.26 times higher in males than in females. Having a smoking sibling increased the risk of smoking 1.95 times, alcohol using increased the risk 2.11 times. We found that when the age difference between siblings is 0-7 years, having a same sex sibling who smokes increases one's risk 4.7 times in females and 5 times in males; when the siblings are of different sexes, according to these age differences

Conclusion: The survey showed that the gender and sibling's and parent's smoking both play a significant role on smoking behavior. But children seem to learn smoking from their siblings more than from parents. Having same sex sibling who smokes plays significant role in smoking behavior for both males and females.

Keywords: Clustered logistic regression, FTND (Fagerström Test for Nicotine Dependence), Nicotine dependence, Paired data, Smoking status, Siblings, Turkey.

INTRODUCTION

It is important to examine whether and how environmental factors are associated with diseases and to develop recommendations and methods to reduce the burden of disease. This is particularly true for smoking. Smoking is a widespread habit that constitutes an important public health problem both in Turkey and throughout the world. By Global Adult Tobacco Survey in Turkey, 27% individuals who are 15 years old and over smoke daily or less than daily in 2012. In 2012, the percentage of regular smokers in Turkey was 36,2% among adults of 15 years and over, with 34,9% and 36,2%, for the 25-34 and 35-44 age groups, respectively [1].

According to the studies performed by Laiker [2], cigarette smoking is the most preventable cause of cardiovascular morbidity and mortality. Smoking has been associated with a two-to fourfold increased risk of coronary heart disease, a greater than 70% excess rate of death from coronary heart disease, and an elevated risk of sudden death. These risks are compounded in the presence of hypertension, hypercholesterolemia, glucose intolerance, and diabetes, all of which exhibit a synergistic effect with smoking. Smokers account for approximately 70% of patients with atherosclerosis obliterans and virtually all those with thromboangiitis obliterans. An association between smoking and cerebrovascular disease remains a matter of debate, although a higher risk of stroke and stroke-related mortality has been observed in smokers than in nonsmokers. Nicotine and carbon monoxide appear to play major roles in the cardiovascular effects of smoking. Both components adversely alter the myocardial oxygen supply/demand ratio and have been shown to produce endothelial injury, leading to the development of atherosclerotic plaque. In particular, smoking cessation results in a dramatic reduction in the risk of mortality from both coronary heart disease and stroke [2].

Lung cancer is in the first place among cancer-related causes of death for both men and women. 30% of lung cancer constitutes squamous cell cancer. Squamous cell cancer has definite relationship with smoking and is more common in men. Also it is one of most common lung cancer in our country [3].

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E-ISSN: 1929-6029/14

Therefore, it is very important to conduct epidemiological research to identify risk factors, which may in turn inform interventions that may help prevent diseases and promote health.

According to the studies performed by Onat [4], the relative risk of smoking at baseline on subsequent coronary mortality, not significant in women, was 1.53 higher among men. This finding is not in disagreement with present knowledge for the American population. In multivariate analysis, smoking proved to be the most significant independent marker of elevated plasma fibrinogen levels among Turks of either gender [4].

According to the studies performed by Pyrgakis [5], smoking increases the likelihood of developing abdominal aortic aneurysm. Specifically, smoking up to 1 pack per day increases the risk threefold, 1-2 packs per day fivefold, and more than 3 packs sevenfold, compared with non-smokers. Smokers have 3 times the risk of suffering an acute myocardial infarction and are at increased risk (relative risk 2.3, 95% confidence interval 1.2-4.0) of sudden cardiac death compared to non-smokers. Smokers are 7 times as likely to develop the disease; the onset of symptoms comes a decade earlier compared with non-smokers. People who stop smoking reduce their 5-year risk of death from an acute coronary syndrome by 61%, and from stroke by 42 [5].

Twin and adoption studies have demonstrated that heritability is at least 50% for both smoking initiation and smoking persistence [6]. Heritability of nicotine dependence is estimated as 44% in Turkish adults. Thus, it is critically important to identify the environmental risk factors that also contribute to smoking. A sibling study is a unique context for examining these questions. The family unit is the primary source of transmission of basic social, cultural, genetic and biological factors that may important individual differences in smoking [7]. Data collected from two siblings from the same family are likely to provide valuable insights into the types of environmental factors that influence smoking. Because siblings share roughly half of their genetic variation and are usually raised in the same or similar environment, they provide a useful test for determining the environmental factors that influence smoking. In particular, siblings close in age will have more shared environmental factors compared to sibling pairs that are not close in age because their environments, schools and friends will be more alike. Genetic relatedness of siblings makes them ideal for determining environmental and genetic factors affecting smoking.

This study is the first sibling study about the influence of parent and sibling behavior on smoking status and nicotine dependence in Turkey. Specifically, we examine the smoking statuses of the individuals and the family and environmental factors that have previously been shown to be related to smoking in previous studies. Similarly, studies performed by Low *et al*. [8], suggest that older sibling substance use has a direct effect on younger sibling use, but relationship dynamics and reinforcement played a significant role as well. Specifically, collusion and conflict in the sibling relationship both had indirect effects through younger siblings' deviant peer affiliation. Findings validate the powerful socializing role of both siblings and peers on smoking outcomes, and elucidate the complex mechanisms through which socialization occurs [8]. Boyle *et al*. [9] also showed that the dominant influence of substance (tobacco, alcohol and marijuana) use behavior appears to be from older siblings to younger siblings. Sibling concordance for substance use suggests that the treatment and prevention of substance use (and abuse) among adolescents and young adults might be enhanced by including a family focus, especially where there are two or more siblings at home. Tobacco use by the older siblings is associated strongly and significantly with tobacco use by younger sibling (relative odds = 4.08 and 95% confidence intervals = (2.75, 6.05) in logistic regression between sibling). But, the strength of association between parental tobacco use by the youngest sibling is small and nonsignificant (relative odds=1.37) [9].

Vink *et al*. [10] investigated whether the relative risk to smoke for males and females is different for same-sex and opposite-sex family members. Their results are in line with Swan *et al*. [11], who reported a significant relative risk for females smoking when their mother smoked but no significant risk ratio when their father smoked. Similar to the association between subjects' smoking and parental smoking, the association with siblings' smoking tended to be sex-dependent. In line with the results of a study by Wang *et al*. [12], the relative risk of being a smoker was elevated more in the case of same-sex smoking siblings than in the case of opposite-sex smoking siblings, especially for the participants aged between 12 and 20. According to the studies performed by Bricker *et al*. [13], the greatest correlates of children's the smoking status was their close friends', parents' and siblings' smoking status; moreover, it was found that a smoking of older sibling had a greater effect compared to the effect of the mother and father. El-Sharkawy's [14] study shows that

being male, increased number and late order in the family, living away from family, young age, having a chronic disease and studying in theoretical faculties are the most important predictors that should be targeted in smoking prevention activities.

The study of Oncel *et al*. [15] research the increase of smoking risks and the related factors by means of conducting a survey with 1734 (11.6% of a total of 15,000 students) students at Kırıkkale University. The smoking risk was 2.97 times more for males than compared to females in this study. A smoking sibling increases the risk of smoking by 2.368 times while a smoking mother increases the risk by 1.564 times and a smoking father increases the risk by 1.488 times [15].

Conrad *et al*. [16] reviewed findings from 27 prospective studies of the onset of cigarette smoking conducted since 1980. In their study, 300 measures of predictors of smoking onset were examined by the authors. According to the study, family smoking, bonding, and approval each received unexpectedly low support. Family smoking received only moderate support, but closer examination found a high level of support for sibling smoking as a predictor of onset (88% of tested cases), but a lower level of support for parent smoking as a predictor of onset (59%). It seems that family, particularly parent behavior and approval variables, play a much less consistently important role in predicting onset than most writers have here-to-fore assumed. This may be a function of changing secular trends; it may be the case that parents played a more important role in adolescent socialization prior to the last decade [16].

In 2010, approximately 43.8 million people, or 19.0% of all adults (aged 18 years or older), in the United States were smokers. Cigarette smoking is more common among men (21.6%) than women (16.5%) [17]. When the results of Oncel *et al*. [15] are compared to the analysis results of USA data (age 18-24), the frequency of smoking in Turkish males are higher compared to males (22.8% to 66.1%) and females (17.4% to 33.9%) in the USA [17, 18]. In view of these population-level differences in smoking frequency, it is important to determine whether the smoking-related risk factors identified in American populations operate similarly in a Turkish population.

MATERIALS AND METHODS

We used Minitab 16 for the power analyses to determine sample size. With a mean difference of 0.1, a standard deviation (SD) of paired differences of 0.5, a type 1 error level of 0.05, and a power of 0.95, the sample size for paired t-tests was 327. With our sample size of 751 for each groups, the power was 0.99. The data was collected by voluntary senior year students attending Kırıkkale University, Faculty of Science and Art, Department of Statistics. The sample of 751 families was selected from families with at least two children. All eligible participants agreed to be included in the study, there was no one unwilling to participate in the survey. The data were directly collected by means of face-to-face interviews with the siblings in the families using a survey to solicit answers; siblings were interviewed separately. For analyses regarding family-level variables, data collected from the randomly selected and initially entered sibling in the first order was used.

A survey form comprising of 29 main questions was designed for the study and national and international forms used in similar studies were used as a reference [7-14, 21-22]. Turkey's social characteristics were considered in the preparation of the questions. For example, in addition to the questions used previously by other studies, we also asked a couple of specific questions in order to determine some socio-economic conditions that we thought might have an effect on smoking in siblings. Kırıkkale University's Ethical Committee issued an approval to collect the data and conduct the surveys.

Descriptive statistics, the Mann-Whitney U Test, Chi-square Test and clustered logistic regression analyses were used to examine the data on the siblings to reveal the factors associated with nicotine dependence, which included the differences between sex, education, income, mother and/or father being a smoker, involvement in sporting activities, the effect of one smoker sibling on the other sibling's smoking status and nicotine dependence.

Each sibling's socio-demographic information was collected by filling a survey form for each one of them. The questionnaire included questions about age, sex, smoking status, smoking status of parents, education level of parents, income, daily sports activities, smoking history (age when smoking was started or quit, daily average number of cigarettes smoked, attempts to quit smoking, and reasons for starting to smoke), alcohol use and behavioral problems. Income was defined using 6 group variables (≤400, 401-800, 801-1200, 1201-1600, 1601-2400, and >2400 US $/month) and two groups (Income2) comprising of income <1200 and

income ≥ 1200 US $ / month because of non-stable exchange rate of Turkish Lira vs US $. The smoking statuses of parents and siblings were also changed to categorical variables having 4 groups (1-10, 11-20, 21-30 and ≥31 cigarettes/day). The education level of parents was defined using 6 group variables (illiterate, primary school, secondary school, high school, university, and graduate).

The Fagerstrom test for nicotine dependence (FTND) score for cigarettes is based on 6 questions developed by the Swedish psychologist Karl O. Fagerstrom (1978) to determine the level of physical dependence on nicotine [22]. The Turkish translation of the FTND we are using in this paper was first introduced and studied by Uysal *et al*. [21] for non-twin data. Each question has a score between 0-9 points, and higher scores indicate greater levels of nicotine dependence. According to the FTND questions 0-3 points indicate low nicotine dependence, 4-6 points indicate average nicotine dependence and 7 and above indicate strong nicotine dependence. According to this scale, a score that is 4 and above indicates the presence of nicotine dependence.

We created a categorical nicotine dependence variable FTND2, corresponding to the total scores between 0-3 (not nicotine dependent, coded as 0), 4-6 (nicotine dependent, coded as 1), 7 and more (severely nicotine dependent, coded as 2) and analyzed the relationship of the nicotine dependence with sex, age, income, education of parents, smoking level of parents, sporting activities and alcohol use (Table **4**).

RESULTS

The survey was conducted on 751 complete pairs of siblings between ages 15 and 69. 188 (25.0%) pairs were both females, 280 (37.3%) pairs were both females and 283 (37.7%) pairs were of opposite sex. sex508 of the males (67.7%) and 242 of the females (32.3%) were smokers for a month or longer and smoked every day. Table **1** presents sex, daily sports activities, frequency of alcohol use, marital status and FTND scores' frequency distributions. In addition to this, it includes the frequency distribution for the smoking status of the sibling and parents which comprise the family variables and the variables which comprise the income and education of the parents as reported by one randomly selected sibling from each pair. We highlight a few key demographic findings here. One hundred and twenty nine (17.2%) siblings smoked even though their sibling, mother and father did not smoke. With respect to smoking status as a function of marital status, 346 (39.2%) of single participants smoked, 328 (56.1%) of married participants smoked, and 14 (40.0%) of the divorced or widowed participants smoked (Table **1**). With respect to smoking status as a function of employment status, 421(54.7%) of employed participants were smokers, 24 (53.3%) of retired participants smoked, 173 (32.6%) of student participants smoked, 59 (43.1%) of housewife participants smoked, and 11(55.0%) of unemployed participants smoked (Table **1**).

The means (standard deviations) calculated for the age of the participating in the survey, the number of cigarettes they smoked daily, the age they started smoking, the FTND score and the alcohol use starting age was, respectively, 30.53 (10.9), 17.47 (8.21), 18.53 (3.5), 4.48 (2.4), 16.70 (4.04) for males and 28.32 (9.88), 13.24 (7.79), 19.86 (4.45), 3.85 (2.44), 18.53 (3.5) for females. Among the siblings who had a maximum 7 years age difference, at which environments of sibling significantly differ, 168 (22.4%) of the pairs were both female, 233 (31.0%) of the pairs were both male and 227 (30.2%) of them were of different sexes. Among the siblings who had more than 7 year age difference, 20 (2.7%) of the pairs were both female, 47 (6.3%) of the pairs were both male and 56 (7.5%) of them were of different sexes.

A positive correlation was detected between the number of daily cigarettes and the FTND score ($r = 0.478$, $p < 0.001$); when this correlation was examined separately by sex it was $r = 0.373$ ($P < 0.001$) for the females and $r = 0.538$ ($P < 0.001$) for the males. A significant negative correlation was found between the age of starting to smoke and the FTND score ($r = -0.252$ $P < 0.001$); when this correlation was considered separately by sex, it was found to be $r = -0.291$ ($P < 0.001$) for females and $r = -0.195$ ($P < 0.001$) for males. A significant negative correlation was found between the number of cigarettes smoked daily and the age at smoking initiation ($r = -0,147$, $P < 0.001$) and when this correlation was considered separately by sex, it was not significant $r = -0.066$ ($P = 0.307$) for females and significant $r = -0.147$ ($P = 0.001$) for males. There was a significant positive correlation between the age participant started smoking and the age he or she first had an alcoholic beverage ($r = 0.268$, $P < 0.001$) and when this correlation was considered separately by sex, it was $r = 0.397$ ($P < 0.001$) for females and $r = 0.191$ ($P = 0.001$) for males.

Correlation for the FTND scores of two siblings decreased as the age difference between the pair of

Table 1: Frequencies of Items of Sociodemographic Variables by Smoking Status

Variables (Risk Factors)		smoking status							
		Non-smokers		Regular Smokers		Former-Smokers		All Individuals	
		N	Row N%	N	Row N%	N	Row N%	N	Table N %
Sex	Male	335	39.7%	473	56.1%	35	4.2%	843	56.1%
	Female	417	63.3%	215	32.6%	27	4.1%	659	43.9%
Daily Sporting Activities	No	565	50.0%	521	46.1%	43	3.8%	1129	75.3%
	Yes	185	50.0%	166	44.9%	19	5.1%	370	24.7%
Alcohol Use	Never	461	57.1%	313	38.8%	33	4.1%	807	53.7%
	Once a year	92	45.5%	99	49.0%	11	5.4%	202	13.4%
	Once a month	88	37.0%	139	58.4%	11	4.6%	238	15.8%
	Once a week	50	32.5%	97	63.0%	7	4.5%	154	10.3%
	Once a day	61	60.4%	40	39.6%	0	0.0%	101	6.7%
Marital Status	Single	531	60.2%	346	39.2%	5	0.6%	882	59%
	Maried	201	34.4%	328	56.1%	56	9.6%	585	39%
	Divorsed / Widowed	20	57.1%	14	40.0%	1	2.9%	35	2%
Working Status	Working	304	39.5%	421	54.7%	44	5.7%	769	20%
	Retired	16	35.6%	24	53.3%	5	11.1%	45	1%
	Student	354	66.7%	173	32.6%	4	.8%	531	23%
	Housewife	69	50.4%	59	43.1%	9	6.6%	137	4%
	Unemployed	9	45.0%	11	55.0%	0	0.0%	20	0.5%
Status of the Success in Working/School	Successful	455	52.7%	367	42.5%	41	4.8%	863	57.4%
	Medium	261	46.5%	280	49.9%	20	3.6%	561	37.3%
	Fail	36	46.2%	41	52.6%	1	1.3%	78	5.2%
FTND (Mean=4.34, st.dev.=2.436)	0			43	86.0%	7	14.0%	50	6.7%
	1			47	82.5%	10	17.5%	57	7.6%
	2			61	91.0%	6	9.0%	67	9.0%
	3			109	90.8%	11	9.2%	120	16.1%
	4			83	91.2%	8	8.8%	91	12.2%
	5			105	90.5%	11	9.5%	116	15.5%
	6			95	97.9%	2	2.1%	97	13.0%
	7			61	93.8%	4	6.2%	65	8.7%
	8			45	97.8%	1	2.2%	46	6.2%
	9			32	100.0%	0	0.0%	32	4.3%
	10			4	80.0%	1	20.0%	5	0.7%
Sibling's Smoking Status[b]	No	239	56.6%	150	35.5%	33	7.8%	422	0.57%
	Yes	118	35.9%	189	57.4%	22	6.7%	329	0.44%
Mother's Smoking Status[b]	No	285	46.9%	272	44.7%	51	8.4%	608	0.81%
	Yes	72	50.3%	67	46.9%	4	2.8%	143	0.2%
Father's Smoking Status[b]	No	200	48.1%	178	42.8%	38	9.1%	416	0.56%
	Yes	157	46.9%	161	48.1%	17	5.1%	335	0.45%

(Table 1). Continued.

Variables (Risk Factors)		smoking status							
		Non-smokers		Regular Smokers		Former-Smokers		All Individuals	
		N	Row N%	N	Row N%	N	Row N%	N	Table N %
Family Income Level (US $/month)	...- 400	3	100.0%	0	0.0%	0	0.0%	3	0.01%
	401-800	31	38.8%	39	48.8%	10	12.5%	80	0.11%
	801-1200	83	50.3%	71	43.0%	11	6.7%	165	0.22%
	1201-1600	107	47.8%	106	47.3%	11	4.9%	224	0.3%
	1601-2400	133	47.7%	123	44.1%	23	8.2%	279	0.38%
Income2	Low (income<=1200)	117	47.2%	110	44.4%	21	8.5%	248	0.34%
	High (income >1200)	240	47.7%	229	45.5%	34	6.8%	503	0.67%
Mother's Educational Level	Illiterate	21	24.7%	48	56.5%	16	18.8%	85	0.12%
	Primary School	121	44.0%	137	49.8%	17	6.2%	275	0.37%
	Secondary School	50	45.5%	53	48.2%	7	6.4%	110	0.15%
	High School	119	56.9%	78	37.3%	12	5.7%	209	0.28%
	University	45	64.3%	22	31.4%	3	4.3%	70	0.1%
	Graduate	1	50.0%	1	50.0%	0	0.0%	2	0.01%
Father's Educational Level	Illiterate	9	37.5%	7	29.2%	8	33.3%	24	0.04%
	Primary School	74	37.2%	105	52.8%	20	10.1%	199	0.27%
	Secondary School	42	38.9%	62	57.4%	4	3.7%	108	0.15%
	High School	135	50.8%	113	42.5%	18	6.8%	266	0.36%
	University	88	62.4%	49	34.8%	4	2.8%	141	0.19%
	Graduate	9	69.2%	3	23.1%	1	7.7%	13	0.02%

[b]Based on the first sibling's response.

siblings increased. For 484 of the pairs of siblings with age differences between 1-4 years, the correlation between the FTND scores were r= 0.232 (P=0.007) and the *Cramer's V* relationship coefficient between the smoking statuses was 0.299 *Pearson's Chi-Square*=43.305, (P<0.001); for 203 of the pairs of siblings with age differences between 5-10, the correlation between the FTND scores were r=0.442 (P<0.001) and the *Cramer's V* relationship coefficient between the smoking statuses was 0.122 (*Pearson's Chi-Square*=3.036, P=0.008); for 64 of the pairs of siblings with age differences that are 10 years or above, the correlation between the FTND scores were r=0.179 (P>0.05) and the *Cramer's V* relationship coefficient between the smoking statuses was 0.344 (*Pearson's Chi-Square*=7.567, P<0,001).

The median, minimum and maximum of the continuous variables consisting of the number of cigarettes smoked daily, the age of starting to smoke, the FTND and age are presented in Table **2**. Because these variables were not normally distributed (Kolmogorov-Smirnov Z test, P<0.001), we used the Mann-Whitney U Test, which showed a significant

Table 2: Mann-Whitney U Test Results by Sex

Variables	Males	Females	Z	P-value*
	Median (Min. – Max.)	Median (Min. – Max.)		
# of Sigarettes per Day	20 (2 - 40)	13 (1 - 40)	-6.737	< 0.001*
Smoking Starting Age	18 (10 - 33)	19 (11 - 40)	-4.158	< 0.001*
FTND	5 (0 - 10)	4 (0 - 9)	-3.514	< 0.001*
AGE	29 (16 - 69)	29 (15 - 61)	-4.607	< 0.001*

[*]P values based on Mann-Whitney U test, *P < 0.05 significant.

Table 3: Associations between Smoking Status and Categorical Variables by Cross Tables

Variable[b]	Pearson's Chi-Square	df	*P*[c] -value	Cramer's V or Gamma
Sex	81.972	1	< 0.001*	0.234
Alcohol Using Level	57.442	4	< 0.001*	0.196
Feeling moody	28.368	1	< 0.001*	0.138
Mother's Education Level	66.677	4	< 0.001*	-0.289
Father's Education Level	61.268	4	<0.001*	-0.282
Sibling's Smoking Status	67.155	1	< 0.001*	0.0211
Sporting Activities	0.000	1	0.988	0.001
Income	1.799	4	0.773	0.039
Income2	1.238	1	0.266	0.029
Mother's Smoking Status	0.030	1	0.864	0.004
Father's Smoking Status	3.078	1	0.079	0.045
Status of the Success in Working/School	10.502	4	0.033*	0.089

[b]Based on the first sibling's response.
[c]P values based on chi square, * P < 0.05 significant.

difference between the sexes for all variables (P < 0.001).

The Chi-square test was performed to determine if there was a significant relationship between categorical variables. Relationship between two nominal variables was estimated by Cramer's V statistic, the Gamma statistic was used to estimate relationship between an ordinal and a nominal variable and the results were presented in Table **3**. A significant relationship was detected between the smoking status, sex, alcohol usage level, feeling moody, education of the parents and the status of success at work/school and the smoking status.

The relationship between the three nicotine dependence categories (FTND2 is low, medium, and severe), sex, alcohol usage, income, parents' education status, sports activities, smoking status of the parents and sibling and the variable were examined with chi-square tests. Table **4** indicates significant relationship between one of randomly selected sibling's smoking status and sex, alcohol usage frequency, income and smoking status of the mother and status of success in work/school variables.

In order to specify the risk factors that affect the smoking status, clustered logistic regression analyses were performed. Sex, age, BMI, smoking status of the parents and sibling, income, the education status of the parents, the frequency of alcohol usage and daily sports activities variables were included in these analyses. The model coefficient ($\hat{\beta}$), Wald statistic, P-value, singularity ratio (ψ) and 95% confidence

Table 4: Associations between Ordinal FTND2 and Categorical Variables by Cross Tables

Variable[b]	Pearson's Chi-Square	df	*P*[c] -value	Cramer's V	Gamma
Sex	12.152	2	0.002*	0.128	-0.217
Alcohol Using Level	25.432	8	0.001*	0.131	0.203
Income	20.092	8	0.010*	0.116	0.058
Mother's Smoking Status	8.045	2	0.018*	0.104	0.219
Mother's Education Level	11.620	8	0.169	0.088	-0.024
Father's Education Level	9.232	8	0.323	0.079	-0.087
Sporting Activities	2.714	2	0.257	0.060	0.029
Father's Smoking Status	3.865	2	0.145	0.072	0.116
Sibling's Smoking Status	1.224	2	0.542	0.040	0.023

[b]Based on the first sibling's response.
[c]P values based on chi square , * P < 0.05 significant

Table 5: Univariate Binary Conditional Logistic Regression Models for Predicting Smoking Status

Variable	df	$\widehat{\beta}$	S.E.	Wald	P-value[c]	$\psi = \exp(\lvert\widehat{\beta}\rvert)$
age	1	-0.05	0.01	98.30	<.0001*	1.06
sex	1	0.96	0.10	94.49	<.0001*	2.61
alcohol using	1	-0.62	0.10	40.99	<.0001*	1.85
sibling's smoking status	1	-0.86	0.06	214.48	<.0001*	2.37
marital status	1	-0.33	0.09	12.18	0.0005*	1.39
daily sports activities	1	0.00	0.11	0.00	0.9876	1.00
feeling moody	1	-0.55	0.10	32.10	<.0001*	1.74
mother smoking status	1	0.02	0.12	0.04	0.8472	1.02
father smoking status	1	-0.18	0.09	3.79	0.0516*	1.20
Mother's education status	1	0.67	0.10	44.46	<.0001*	1.96
father's education status	1	0.79	0.09	71.29	<.0001*	2.21
income2	1	-0.12	0.10	1.52	0.2174*	1.13
bmi	1	-0.13	0.02	65.30	<.0001*	1.14
Status of the succes in working/ school	1	-0.20	0.08	5.36	0.0206*	1.22

[c]P-values based on logistic regression; *P < 0.05 significant.

intervals of this ratio was used to decide which variables could be candidate variables for the multivariable clustered logistic regression model. If the P value of any of the variables was smaller than the value 0.05 according to the single-variable test result, that variable was included in the multivariate model as a significant variable.

The risk of smoking was 2.26 times higher in males than in females. Having a smoking sibling increased the risk of smoking 1.95 times; alcohol using increased the risk 2.11 times. The study also shows that age, feeling moody, father's education status, and BMI all play a significant role in smoking behavior among students. Smoking status was not significantly correlated with income, marital status, mother's education status, smoking status of both parents,or success at work/ school (Table **6**).

As smoking statuses of siblings affect each other, these risks were re-calculated depending on sibling's

Table 6: Binary Multivariate Conditional Logistic Regression Results for Predicting Smoking Status

Variable	d.f.	$\widehat{\beta}$	S.E.	Wald	P-value[c]	$\psi = \exp(\lvert\widehat{\beta}\rvert)$
Intercept	1	1.57	0.62	6.37	0.0116*	4.81
age	1	-0.04	0.01	27.39	<.0001*	1.04
sex	1	0.82	0.13	41.16	<.0001*	2.26
alcohol using	1	-0.74	0.12	39.51	<.0001*	2.11
sibling's smoking status	1	-0.67	0.08	78.81	<.0001*	1.95
marital status	1	0.06	0.08	0.47	0.4952	1.06
feeling moody	1	-0.48	0.12	17.16	<.0001*	1.61
father smoking status	1	-0.19	0.12	2.35	0.1251	1.21
mother's education status	1	0.26	0.16	2.70	0.1001	1.29
father's education status	1	0.42	0.14	8.62	0.0033*	1.52
income2	1	-0.19	0.13	2.00	0.1569	1.21
bmi	1	-0.04	0.02	3.99	0.0457*	1.04
Status of the succes in working/ school	1	-0.13	0.10	1.70	0.192	1.14

[c]P-values based on logistic regression; *P < 0.05 significant.

Table 7: Univariate Logistic Regression Models for Predicting Smoking Status of Sibling1 *Via* Smoking Status of Sibling2

Sex	Age difference between siblings	$\hat{\beta}$	Wald	P^d-value	ψ
Both siblings are females	0-7 (n=168)	1.549	19.508	.000*	4.705
	8+ (n=20)	0.182	0.037	0.848	1.200
Both siblings are males	0-7 (n=233)	1.610	31.603	.000*	5.004
	8+ (n=47)	1.003	2.023	.155	2.727
Opposite sex siblings	0-7 (n=227)	0.314	1.371	.242	1.369
	8+ (n=56)	0.154	.082	.774	1.167

*Siblings smoking increases risk of smoking ψ times.

[d]P values based on logistic regression. *P <0.05 significant.

sex and age difference. We selected one of siblings as 'sibling1' randomly and then defined the other sibling as 'sibling2'. We found that when the age difference between siblings is 0-7 years, having a same sex sibling who smokes increases one's risk 4.7 times in females and 5 times in males; when the siblings are of different sexes, according to these age differences (Table **7**).

DISCUSSION AND CONCLUSION

This study was conducted to determine the factors that affect smoking behaviors. To our knowledge, these findings are the first detailed data analysis on smoking statuses of siblings in Turkey obtained by using FTND scores. According to the results of our study, sex, siblings, and parents that smoke play a significant role on smoking behavior. But, it seems highly plausible that children learn smoking behaviours from their siblings more than parents. The multivariate conditional logistic regression model was used to evaluate the data and find the optimum model.

If there is a smoker in the family, that family is more interested in smoking and this increases the risk of the offspring beginning to smoke. Therefore, parents should not allow children to smoke. For this reason, campaigns to quit smoking should be prepared by considering family values and setting an example. Females are affected by their sisters more so than by their brothers, while males are affected by their brothers more so than by their sisters. It was thought that the reason why alcohol consumption has a weak association to smoking in this sample could be because the frequency of alcohol use is lower in Muslim societies due to religious beliefs. Employed people smoke more than retired people could be caused by stress related to work or easy access to high priced tobacco products The person's sports activities variable did not reflect activities because many individuals answered 'yes' to this question even if they had only limited activities. In the future, we will use a more definite variable to assess sports activities.

The number of cigarettes smoked by young subjects and the increase of their nicotine dependence was related to the increase of smoking in siblings. It is recommended that smokers are also informed about the harms of smoking and the health benefits of quitting smoking. Currently, minimum age for buying tobacco in Turkey is 18. However, our study show that a large portion of smokers start smoking the age of 18. Accordingly, 18 years age cigarette ban rule has problems in real life. Because the age of smoking has lowered children should be given education on the harms of smoking and alcohol during primary school. It is thought that smoking for the first time is related to alcohol usage and that these two trigger each other. It is thought that the reason that those working at a workplace smoke more could be a result of stress. Therefore, it is important train employees on methods to manage stress.

DECLARATION OF CONFLICTING INTERESTS

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

FUNDING

The authors received no financial support for the research and/or authorship of this article.

ACKNOWLEDGEMENTS

We would like to thank Kırıkkale University, Faculty of Science and Art, Department of Statistics students

for voluntarily helping us in collecting data. The authors also are grateful to Dr. J. Salvatore for her suggestions and recommendations that improved the manuscript.

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Received on 02-04-2014 Accepted on 21-04-2014 Published on 30-04-2014

http://dx.doi.org/10.6000/1929-6029.2014.03.02.5