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Smoking and Real Life Results of Children and Adolescents

Çocuklar ve Ergenlerin Sigara İçme ve Gerçek Yaşam Sonuçları

Ayşegül ERTUĞRUL[1], Eyüp SARI[2], İlknur BOSTANCI[1],

[1]Health Science University Dr. Sami Ulus Maternity and Children Research and Training Hospital, Department of Pediatric Allergy and Clinical Immunology, Ankara, Turkey
[2]Health Science University, Ankara, Turkey

Abstract

Aim: Smoking is a chronic disease and children are the most affected group. In this study, we aimed to question the smoking habits of children and their parents and examine the level of exhaled carbon monoxide (eCO) to evaluate the usefulness of the method in an outpatient allergy clinic.

Material and Method: A questionnare was applied to 29 children who were smoker or exposed to second-hand smoke (SHS) and their parents separately. eCO levels of the participants were measured with CO Smokerlyzer.

Results: The median eCO level of children who smoked was 10 (7-14) ppm and was significantly higher than children exposed to SHS (P <0.001). The children who smoked were significantly older, the more they had friends who smoked. Children who were not exposed to tobacco products had lower rates of hospitalization due to recurrent lower respiratory tract infections, and family history of asthma was lower than children exposed to SHS (p <0.05). All the children were aware of the harmful effects of smoking. 34.5% of the parents were never questioned by their physicians about tobacco and its products and were not informed about smoking.

Conclusion: Using eCO in the clinic is a useful method to predict smoking status in daily practice. Children's attitudes towards smoking and peer relationships and parents' ignorance of smoking and SHS are still an unresolved issue.

Keywords: Carbon monoxide, cigarette, children, nicotine, passive smoker, secondhand smoke, smoking, tobacco

Öz

Amaç: Sigara içmek kronik bir hastalıktır ve çocuklar en çok etkilenen gruptur. Bu çalışmada, alerji polikliniğinde çocukların ve ebeveynlerinin sigara içme alışkanlıklarını sorgulamayı ve ekshale edilen karbon monoksit (eCO) yönteminin yararlılığını değerlendirilmesini amaçladık.

Gereç ve Yöntem: Sigara içen veya ikinci el dumana (SHS) maruz kalan 29 çocuk ve ebeveynlerine ayrı ayrı anket uygulandı. Katılımcıların eCO seviyeleri CO Smokerlyzer ile ölçüldü.

Bulgular: Sigara içen çocukların medyan eCO düzeyi 10 (7-14) ppm idi ve pasif sigaraya maruz kalan çocuklarda anlamlı derecede yüksekti (p <0,001). Sigara içen çocukların yaşı daha büyüktü, ve sigara içen arkadaşları vardı. Tütün ürünlerine maruz kalmayan çocukların tekrarlayan alt solunum yolu enfeksiyonları nedeniyle hastaneye yatış oranları daha düşüktü ve ailede astım öyküsü daha azdı (p <0,05). Bütün çocuklar sigaranın zararlı etkilerinin farkındaydı. Ebeveynlerin% 34,5'i tütün ve ürünleri hakkında hekimleri tarafından hiç sorgulanmamış ve sigara hakkında bilgilendirilmemişti.

Sonuç: Klinikte eCO kullanmak, günlük pratikte sigara içme durumunu tahmin etmek için yararlı bir yöntemdir. Çocukların sigara içmeye ve akran ilişkilerine karşı tutumları ve ebeveynlerin sigara ve pasif sigara konusundaki bilgisizliği hala çözülmemiş bir konudur.

Anahtar Kelimeler: Karbon monoksit, sigara, çocuk, nikotin, pasif içici, ikinci el sigara, sigara, tütün

Corresponding *(İletişim)*: İlknur BOSTANCI, Health Science University Dr. Sami Ulus Maternity and Children Research and Training Hospital, Department of Pediatric Allergy and Clinical Immunology, Ankara, Turkey
E-mail *(E-posta)*: ilknurbirol@hotmail.com
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INTRODUCTION

The use of tobacco and tobacco products is a preventable public health problem that threatens human health. Smoking is a chronic disease and at a high rate starts in childhood. Not only active smoking but also second-hand smoke (SHS) is an important problem all over the world. Children are the group most affected.[1] SHS increases the risk of upper and lower respiratory infections, ear infections, dental caries, asthma attacks, attention deficit-hyperactivity disorder and learning disabilities.[2,3] Exposure to cigarette smoke adversely affects lung and brain development in children.[4,5]

Tobacco exposure can be determined by measurement of nicotine or cotinine in urine, saliva or blood. However, there is limited use in clinical practice due to interpersonal variability and the lack of a rapid test that can be used in the market.[6] Even though carbon monoxide (CO) is not a specific marker for tobacco, studies have shown a significant correlation between exhaled CO (eCO) and the number of cigarettes smoked in the last 24 h and eCO level more than 6 ppm giving an appropriate sensitivity and specificity to detect a smoker in outpatient clinics.[7,8] For active smoking and SHS environmental monitoring, measuring eCO is relatively simple, non-invasive and easy method. Studies have shown the usefulness of eCO, distinguishing between non-smoking and smoking environments.[6]

Questioning about the smoking habits of children and parents in to account is essential to recognize the problem.[9] The objective of the present study was to question the smoking habits of children and their parents and examine the level of eCO to evaluate the usefulness and benefits of the method in an outpatient clinic.

MATERIAL AND METHOD

This was a cross sectional study examining smoking habits of the school aged children who were followed up at the Department of Pediatric Allergy in a tertiary center. 35 patients and their parents were included in our study. Thirty-five participants and their mothers/fathers were included in the study. Three of the participants excluded from the study due to lack of data. Three children who had quitted smoking within the 6 months before the date of the interview were also excluded. eCO level was assessed in a total of 29 pediatric patients and their parents. The children exposed to SHS or active smokers were included in the study. An active smoker was defined as a person who currently smoked at least one cigarette a day. A person was supposed to be exposed to SHS if a household member (at least one of the parents) had regularly smoked cigarettes in their presence. All patients included in the study were under control without medications for the disease they were being followed in the allergy department. Children suffering from any serious internal diseases other than allergic diseases or suffering from acute respiratory infections within the last four weeks were excluded from the study.

Questionnaire

We evaluated the sociodemographic characteristics, smoking habits and attitudes of the children who were smoker or exposed to secondhand smoke and their parents by a questionnaire. The questionnaire was applied to parents and children separately.

Exhaled CO Measurement

eCO levels of the participants were measured with CO Smokerlyzer (Bedfont Scientific, Kent, England). The results were given in part per million (ppm), sensitive to 0–100 ppm of CO.

Ethical Issues

The ethical permission was obtained from the local etic committee of Health Sciences University, Dr Sami Ulus Maternity and Children Training and Research Hospital (73799008/2017). After data collection the participants were informed about the hazards of smoking.

Statistical analysis

All data were analysed by using the statistical program SPSS (Statistical Package for Social Sciences 15; SPSS Inc., Chicago, IL, USA). The Chi-squared test was applied to assess differences in categorical variables. Student's two-tailed t test was used for comparison between two independent groups of normally distributed data and Mann–Whitney U test for non-normally distributed data. Spearman correlation analyses were used to evaluate the relationship between the exhaled CO levels of the children and their parents. A p value of <0.05 was considered to be statistically significant.

RESULTS

Characteristics of the children and the levels of eCO are shown in **Table 1**.

The median eCO level of the children was significantly higher in active smokers than the children exposed to SHS ($p<0.001$). There were no significant differences between eCO levels in the different groups with sex, living place, dental caries, active sports and attention deficit-hyperactivity disorder ($p>0.05$). No significant differences between the eCO levels of the patients were found in terms of the diagnoses in both groups separated as asthma and/or allergic rhinitis and the other allergic diseases ($p>0.05$). The eCO levels of the children with recurrent lower respiratory tract infections were significantly lower ($p=0.009$).

The median eCO level (IQR) was 3 (2-7) ppm for the children and 6.5 (5-9.75) ppm for parents as shown in **Table 2**. The median eCO level of the active smoker children were higher than the median eCO level of active smoker parents. Evaluating the children and parents who were exposed to SHS; the median eCO level of the parents were higher than the children. No significant correlation was found between the eCO measurements of the children exposed to SHS and their active smoker parents in the Spearman's correlation analysis ($r= 0.026$, $p= 0.461$).

Table 1. Characteristics of the children and the levels of exhaled carbon monoxide (eCO)

Characteristics of the patients	Number (%)	eCO level of the patients (ppm) median (IQR)*	p
Total number of the patients	29	3 (2-7)	
Age (year), mean±SD	14±3.5		
Sex			>0.05
Male	21 (72.4)	3 (2-8.5)	
Female	8 (27.6)	1.5 (1-5.25)	
Body mass index (%), median (IQR)		59.5 (28.7-90)	
Maternal smoking at pregnancy			>0.05
Yes	5 (17.2)	3 (2-5.5)	
No	24 (82.8)	2.5 (1.25-8.75)	
Living in big city	26 (89.7)		
Living in town	3 (10.3)		
Diagnosis			>0.05
Asthma and/or Allergic rhinitis	24 (82.8)	3 (2-7.5)	
Other **	5(17.2)	2 (1.5-6.5)	
Smoking status			<0.001
Active smoker	9 (31)	10 (7-14)	
Exposed to SHS	20 (69)	2 (1-3)	
Recurrent lower respiratory tract infections			0.009
Yes	6 (20.6)	1.5 (0.75-2)	
No	23 (79.3)	3 (2-9)	
Dental caries			>0.05
Yes	15 (51.7)	2 (1-5)	
No	14 (48.3)	3 (2-8.25)	
Active sports			>0.05
Yes	6 (20.7)	5.5 (1.75-10.5)	
No	23 (79.3)	3 (2-6)	
Attention deficit-hyperactivity disorder			>0.05
Yes	8(27.6)	3 (2.25-7)	
No	21 (72.4)	2 (1.5-7.5)	

*IQR; Interquartile Range, * *Atopic Dermatitis, Drug Allergy, Urticaria-Angioedema

Table 2. eCO level of the participants

	CO level of the children (ppm) median (IQR)	CO level of the parents (ppm) median (IQR)
All patients n= 29	3 (2-7)	6.5 (5-9.75)
Active smoker	10 (7-14)	7 (5-10)
Exposed to SHS	2 (1-3)	4 (4-4)

Actively smoking children were significantly older, they had more smoking friends, lower hospitalization rates due to recurrent lower respiratory tract infections and lower family history of asthma than the children exposed to SHS (p= 0.008, p=0.006, p=0.027, p= 0.033). The number of the upper respiratory tract infections per year, the number of sinusitis per year and the number of otitis media per year was not statistically different (p> 0.05) between both groups (active smoker children and children exposed to SHS).

Middleton et al 7 demonstrated that breath CO concentration > 6 ppm strongly suggests that an outpatient is a smoker. Only children who actively smoked had eCO levels above 6 ppm in our study. Out of the 9 active smoking children (smoking less than 11 cigarettes daily), 2 had eCO levels below 6 ppm, which is typically regarded as the threshold for active smoking according to literature. Sociodemographic characteristics and smoking patterns of the parents are shown in **Table 3**,**4**.

Table3. Sociodemographic characteristics of the parents

Characteristics of the parents	Number (%)
Age of mother (year), mean±SD	37±4.9
Age of father (year), mean±SD	41±5.7
Number of family members, mean±SD	4.35±1.07
Education levels of the mothers	
Literate	1 (3.4)
Primary-Intermediate-high school	24 (82.8)
University and after	4 (13.8)
Education levels of the fathers	
Literate	6 (20.7)
Primary-Intermediate-high school	19 (65.5)
University and after	4 (13.8)
Employment status of the parents	
Working mother	8 (27.6)
Working father	22(75.9)
Mean income of the families (Turkish lira), median (IQR)	2000 (1500-4000)

Table4. Parents' smoking habits

Parents' smoking habits	Number (%)
Smoking habits of the mother	
Never used	8 (27.6)
Quitted smoking	2 (6.9)
< 11 cigarettes /daily	13 (44.8)
11-20 cigarettes/daily	4 (13.8)
21-30 cigarettes/daily	1 (3.4)
>30 cigarettes/daily	1 (3.4)
Smoking habits of the father	
Never used	1 (3.4)
Quitted smoking	4 (13.8)
< 11 cigarettes /daily	6 (20.7)
11-20 cigarettes/daily	11 (37.9)
21-30 cigarettes/daily	4 (13.8)
>30 cigarettes/daily	3 (10.3)
Smoking in home	22 (75.8)
Smoking in working place	15 (51.7)
Attempted to quit smoking	17 (58.6)
Willingness to quit smoking	18 (62.1)

According to parents' statements, smoking rate at home was 44.8%, but including those who said yes to the question of smoking on the balcony/terrace/toilet of the house, the rate increased to 75.8%. 65.5% of the parents reported that they were informed by their doctors about smoking. 62.1% of parents and 55.5% of children who were current smokers stated that they wanted to quit smoking. The most important obstacle for children to quit smoking was inability of self-control, stress, irritability, friends and school environment. Frequent barriers for parents were stated as flabbiness, irritability and experiences. Other reasons for the parents were self-distrust, habits, stress, unwillingness and smoker spouse.

All children approved in the questionnaire that smoking is harmful to health, smoking may cause cancer, cigarette smoke has harmful side effects on other people and the environment. However, 24.1% of the children reported that smoking relieves stress and makes me feel relaxed, 13.8% of the children reported that smoking makes me happy, 10.3% of the children reported that smoking helps to get acceptance in the groups of friends, 10.3% of the children reported that smokers are attractive.

DISCUSSION

Most of the people start smoking at very young age. Worldwide, surveys indicate that about 7% or just over 24 million children aged 13–15 years smoked cigarettes in 2000– 2017.[10] According to the Global Adult Survey Turkey Report 2012, 16.1% of smokers started smoking under the age of 15 and 58.7% started smoking under the age of 18. In Turkey, despite the tobacco control studies within the frame of tobacco control policies and MPOWER package released by World Health Organization (WHO) smoking rates among young children are approximately two-three times higher than the smoking rate for the worldwide.[11] Therefore, smoking is a very important but ignored health problem that should be questioned in all pediatric outpatient clinics.

Our study population was a representative sample of patients being followed in an allergy department in a tertiary centre with a mean age of 14 years. eCO can be used in adolescents as a predictor of smoking status, environmental tobacco smoke exposure and an indicator of nicotine dependency.[12] In our study the eCO level was significantly higher in smokers than the group exposed to SHS. The level of eCO did not exceed 6 ppm in children who were exposed to SHS. The mean eCO level of the children exposed to SHS was 2.2±1.5 ppm which were similar to the eCO level (2.8±2.6 ppm) of adolescences exposed to SHS reported by Vancelik 12 and higher than determined for the non-smoker subjects (1.8±1.9 ppm) as reported. As shown in previous studies, passive smokers had higher eCO concentration than healthy non-smokers, but this elevation was not always significant.[13] Not establishing healthy control group in to our study was an ethical issue about not including the healthy children in a tobacco study. The eCO level of two smoking patients was found to be under 6 ppm. Besides, some of the patients who were exposed to SHS had eCO levels reaching 6 ppm. One of these patients was working in a hookah café as a waiter. Laranjeira et al.[14] reported that exposure to environmental tobacco smoke is the most likely cause for the increase in eCO levels among non-smoking waiters. The half-life of CO is between 5-6 hours in the body and probably restored to normal after 24-48 hours if one is not exposed to smoking.[7,15] The fact that the time of the last cigarette use is very important for the evaluation. And this handicap explains why two of the active smoker children had lower eCO levels than that considered to be the active smoking limit and explains why no significant correlation was found between the eCO measurements of the children exposed to SHS and their parents' in our group. So it is not possible to predict the severity of SHS exposure of the children by their parents' eCO levels. In our study the time of the last cigarette usage was not recorded and this limited our critics.

eCO is also considered as a biomarker of pulmonary diseases like asthma but asthma control is the most important factor affecting the levels of eCO. Patients who had asthma under control did not show significant differences between the levels of eCO from the healthy controls.[16,17] All of our study population were under control for the allergic diseases they had been followed up. However, it should be kept in mind that the level of eCO may be affected in children with uncontrolled respiratory diseases.

The effects of smoking vary according to the age of exposure. In our study group when considered in terms of recurrent infections (upper respiratory tract infections/otitis media/ sinusitis per year), dental caries and attention deficit-hyperactivity disorder there was no significant differences between active and passive smokers. None of the patients who were hospitalized due to recurrent lower respiratory tract infection were active smoker and also, family history of asthma was fewer in this group. It is considered that hospitalization due to the recurrent lower respiratory tract infections and family history of asthma may have caused a change of attitude in these children about smoking. But the parents of them were unaware of the importance of the SHS exposure and all these children were passive smokers. At this point, by clinicians every hospital visit can be turned into an opportunity to inform parents about hazards of smoking and support and motivate the parents to quit smoking.

The impact of parental smoking has been studied in a wide range of contexts in a large number of studies with a variety of outcomes.[18] In our study no differences could be observed in terms of the presence of household members smoking in the house but the number of smoker friends were significantly higher in the active smoker group. The influence of friend smoking may be more potent on intentions to smoke among young people rather than family smoking. Kim et al.[19] found that, as the number of surrounding cigarette smokers increases, the smoking rate in teenagers increases, and there is a tendency to vary according to social status.

The impact of socioeconomic status and family education on smoking of adolescents is controversial in the literature.[18] In our study 87.2% of the parents were graduated from primary-intermediate- high school with low socioeconomic income. Some of the parents did not accept smoking in the kitchen, on the balcony or in the toilet as smoking at home. And we considered that they didn't have enough information about indoor smoking. Exposure to SHS is still one of the most common indoor pollutants and poses a substantial health risk and disease burden for children worldwide. Public health strategies and complementary educational strategies to reduce exposure to SHS at home is essential.[1]

During outpatient visits for their children, 34.5% of the parents were neither queried about their smoking status nor informed about SHS.. Pediatricians should be trained for tobacco control. Even if smoking status of the patients is questioned, applications are limited by the doctor's experience. As with many other chronic diseases, there should be an action plan for smoking child. Although there are many smoking cessation centres that can guide adults, there are limited or no centers for children to divert.

The creation of the negative image of tobacco and products among young people is required to prevent tobacco use.

CONCLUSION

Utilizing eCO in the clinic is an easy and useful method to predict smoking status and additionally convincing for the children and parents to see the objective results of the of smoking on themselves. It is not possible to predict the influence of SHS on children by using eCO levels of parents. Evaluating the eCO is successful in showing the direct effects of smoking but different measurements are needed to assess the secondary effects observed due to exposure to domestic cigarette smoke.

Ignorance of parents about smoking and SHS is a still unresolved issue. On the other hand, children's attitudes about smoking and their peer relationships are more important than lack of education. Outpatient visits are an opportunity but pediatricians don't pay enough attention on smoking children. Health professionals need guidelines about smoking children for a standard approach.

What is already known

Smoking is a chronic disease and at a high rate starts in childhood. Utilizing eCO in the clinic is an easy and useful method to predict smoking status.

What this study adds

It is not possible to predict the severity of SHS exposure of the children by their parents' eCO levels. Parents need to be educated about smoking but children's attitudes about smoking and their peer relationships are more important than lack of education. Health professionals need guidelines on smoking children for a standard approach.

ETHICAL DECLARATIONS

Ethics Committee Approval: The ethical permission was obtained from the local etic committee of Health Sciences University, Dr Sami Ulus Maternity and Children Training and Research Hospital (73799008/2017).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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