Original Article
Eurasian Journal of Critical Care

Detection of Breath Alcohol After Oral Anti-Inflammatory Spray Use

Yeşim İşler[1], Halil Kaya[1], Melih Yüksel[1], Mehmet Oğuzhan Ay[1], Mehtap Bulut[1]
[1] Health Science University, Faculty of Medicine, Department of Emergency Medicine, Yuksek Ihtisas Training and Research Hospital, Bursa, Turkey.

Abstract

Background: We aimed to investigate the effect of ethanol-containing oral antiseptic sprays on breath alcohol levels and its relationship with time and body mass index.

Materials and Methods: This study includes the results of 99 patients. Body mass index of each individual was recorded. Individuals were asked to blow into the alcoholmeter immediately after taking 8 puffs of oral antiseptic sprays and in this way, the breath alcohol concentration. 0th minute value was obtained. The measurements were repeated three times, at the 3rd, 5th, and 10th minutes. Breath alcohol concentration values were recorded.

Results: The median age of the patients was 34 (IQR 25-75: 28-42) and 55 (55.6%) of the patients were male. While the mean alcohol level measured at the 0th minute was 0.075 ± 0.013 promil, the mean alcohol level measured at the 10th minute was 0.001 ± 0.004 promil. A statistically significant difference was found between the alcohol levels measured at the 0th, 3rd, 5th, and 10th minutes (χ^2:288,762, p<0.001). A statistically significant difference was found between all groups in the pairwise comparison of alcohol levels measured at the 0th, 3rd, 5th, and 10th minutes (p<0.001).

Conclusion: This study shows that ethanol-containing sprays may exceed the legal criteria in breath alcohol measurements.

Keywords: Emergency department, breath alcohol measurement, oral antiseptic spray, alcoholmeter, body mass index

Introduction

Alcohol is one of the main causes of traffic accidents all over the world. However, laws and restrictions on drunk driving differ from country to country. According to the traffic laws enacted in our country, driving under the influence of alcohol is forbidden for professional drivers, but non-professional drivers are allowed to drive with breath alcohol levels up to 0.5 promile (corresponding to 50 mg/dL ethanol in the blood)1. Studies have shown that the use of some soft drinks, foods, and drugs can cause short-term false positive breath alcohol concentration (BAC) values. Roadside preliminary breath alcohol testing is one of the strongest deterrents available for police enforcement. However, some products such as mouth spray, frequently taken by individuals, are sometimes used as a justification for high BAC levels[2].

When analyzing a person's breath, the alcoholmeter analyzes the alcohol expelled from the lungs along with the air of alveolar origin. One of the most important causes of false positive results with alcoholmeter is residual alcohol in the mouth, throat, and stomach. Oral antiseptic sprays (OAS) are generally used in throat infections or as a precaution against infections. Such sprays are sold in pharmacies without a prescription. Many people buy these types of sprays and use them for various purposes such as eliminating smoke smell. As such widespread use sometimes causes false positive results in the measurement of breath alcohol level, a confirmation of blood alcohol level measurement may be required. In case of an objection to the breath alcohol level measured in traffic, following an appeal to the court, alcohol can be eliminated from the body to a significant extent in the intervening period. In studies, the effects of mouthwashes containing alcohol and various foods and beverages on alcohol levels have been investigated[2,3].

In this study, we aim to determine whether BAC values are higher than the legal upper limit and the rate of elimination with the help of alcoholmeter following the use of OAS in patients with tonsillopharyngitis who did not consume alcohol. We also investigate the relationship between BAC values and body mass index (BMI).

Materials and Methods

A total of 130 patients who presented to the Emergency Department of Health Sciences University Bursa Yüksek İhtisas Training and Research Hospital between 15 April 2021

Corresponding Author: Yeşim İşler **e-mail:** yesimisler@gmail.com
Received: 04.03.2022 • **Revision:** 16.04.2022 • **Accepted:** 21.04.2022
DOI: 10.55994/ejcc.1082771

Cite this article as: Isler Y, Kaya H, Yuksel M, Ay MO, Bulut M. Detection of breath alcohol after oral anti-inflammatory spray use. Eurasian Journal of Critical Care. 2022;4(1): 12-15

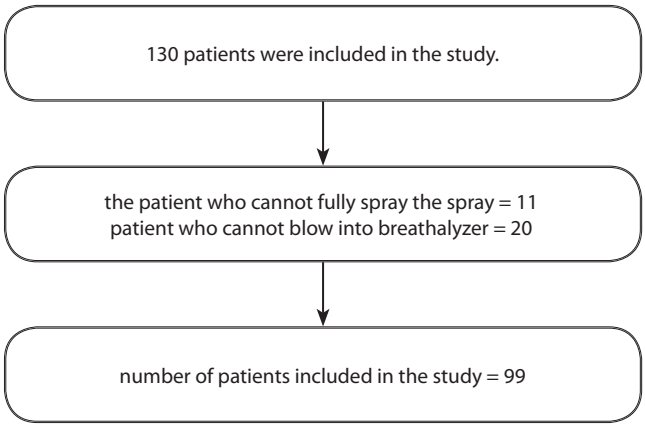

Figure 1: Flowchart on the study

and 31 April 2021 with complaints of tonsillopharyngitis were included. Since 11 of the patients could not spray fully and 20 could not blow into the alcometer, they were excluded from the study. A total of 99 patients participated in the study (Figure 1). Written approval was obtained from the ethics committee of our hospital during the planning phase of our study (2011-KAEK-25 2021/03-04).

Age, gender, height, weight, and BAC values of the patients were recorded. Inclusion criteria of the study were being selected randomly among individuals with tonsillopharyngitis complaints, being over the age of 18, not having a chronic disease, and being volunteered to participate in the study. On the other hand, the exclusion criteria were smoking at least one hour before, using alcohol the day before, having a piercing in the mouth, being pregnant, having oral or dental treatment, and having an oral prosthesis. In the study, a mouth spray (Tanflex) known to contain methyl parahydroxybenzoate 30 mg, ethanol 95% (3 mL), sodium bicarbonate 3.3 mg was used.

BAC values were measured with a Four Season Alcoholmeter and disposable mouthpieces were used. The device sensor is an advanced semiconductor oxide alcohol and the measuring range is 0.05 % - 0.50 % bac (0.0-5g/l). Alcoholmeters are based on the principle that the current passing through the instrument sensor electrodes during the oxidation of ethanol is proportional to the amount of ethanol.

The environment where the mouth spray was applied to the volunteers and the measurements were made with the alcoholmeters was ventilated, taking into account the indoor air quality in a way that it would not cause any contamination. Each volunteer was taken to the environment one by one, ethics committee consent forms were signed, information was given about the study, and height, weight, and age measurements were recorded. Before applying the mouth spray to the volunteers, breath alcohol levels, called passive alcohol test (blind), were measured. The result of all volunteers was negative. Participants were asked to squeeze and swallow 8 puffs of the Spray. Then, breath measurements were taken with an alcoholmeter device at the 0th, 3rd, 5th, and 10th minutes.

Statistical Analysis

IBM SPSS Statistics for Windows, Version21.0 (IBM Corp. Armonk, NY: USA. Released 2012) was used for statistical analysis. Descriptive statistics were expressed as mean ± standard deviation (minimum – maximum), median to range and/or interquartile range (IQR) for numerical variables, while they were expressed as number of cases and (%) for categorical variables. The Kolmogorov-Smirnov test was used for the normality distribution of the data. While the Pearson correlation analysis was used to evaluate the relationships between the variables with parametric distribution, the spearman correlation analysis was used to evaluate the relationship between the variables with nonparametric distribution. The Friedman test was used to investigate whether there was a systematic difference between the rankings of three or more dependent groups showing a nonparametric distribution.

Results

A total of 99 patients were included in the study. The median age of the patients was 34 (IQR 25-75: 28-42). While 55 (55.6%) of the patients were male, 44 (44.4%) were female. The mean alcohol level measured at the 0th minute was 0.075 ± 0.013 promil whereas the mean alcohol level measured at the 10th minute was 0.001 ± 0.004 promil (Table 1).

Table 1: Clinical Data

	BMI*	0. Min.	3. Min.	5. Min.	10. Min.
Mean	27.21	0.075	0.041	0.013	0.001
Std. Deviation	4.57	0.013	0.017	0.017	0.004
Minimum	17.69	0.03	0.01	0.00	0.00
Maximum	38.42	0.11	0.08	0.06	0.02

*. Body Mass Index

In the Spearman correlation analysis performed to determine whether there was a correlation between the alcohol levels measured at the 0th, 3th, 5th, and 10th minutes with the BMI, a slightly positive correlation was found between the alcohol level measured at the 10th minute and the BMI ($p<0.05$, $r=0.239$) (Table 2).

A statistically significant difference was found in the Friedman test performed to investigate whether there was a difference between the alcohol levels measured at the 0th, 3th, 5th, and 10th minutes (χ^2 :288,762, $p<0.001$) (Table 3).

Table 2: Spearman Analysis of Variables

			BMI	0.Min.	3. Min.	5. Min.	10. Min.
Spearman's rho	BMI	r	1.000	0.026	0.083	0.070	**0.239***
		p		0.800	0.417	0.490	**0.017**
	0. Min.	r	0.026	1.000	0.700 **	0.514 **	0.323 **
		p	0.800		0.000	0.000	0.001
	3. Min.	r	0.083	0.700 **	1.000	0.723 **	0.366 **
		p	0.417	0.000		0.000	0.000
	5. Min.	r	0.070	0.514 **	0.723 **	1.000	0.474 **
		p	0.490	0.000	0.000		0.000
	10. Min.	r	0.239*	0.323 **	0.366 **	0.474 **	1.000
		p	0.017	0.001	0.000	0.000	

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Table 3: Analysis Table of Measurements

	Median IQR(25-75)	Friedman test
0. Min.	0.08 (0.07-0.08)	χ^2 :288.762, p<0.001
3. Min.	0.04 (0.03-0.06)	
5. Min.	0(0-0.02)	
10. Min.	0 (0-0)	

Discussion

In this study, we aimed to investigate the effect of oral antiseptic spray use on breath alcohol level and its relationship with time in patients with tonsillopharyngitis complaints. We needed to conduct this study because there was no clear time period in previous studies. We also increased the study group and aimed to investigate the effect of BMI on BAC value.

Driving under the influence of alcohol causes traffic accidents and deaths. In order to prevent alcohol-related traffic accidents, countries have enacted traffic laws that set alcohol limits. Drink-driving roadside screening is a common practice performed by police officers throughout the world. In many countries, the BAC is accepted as evidence for prosecuting drivers. The breath alcohol test is based on the ratio between blood alcohol and alveolar air alcohol. The ratio of blood alcohol to breath alcohol is 1:2100. Many alcoholmeter devices use this ratio to convert the amount of alcohol in the breath to the amount of alcohol in the blood. In order to determine the alcohol in the blood, the value obtained by the alcoholmeter is multiplied by 2100 and it reflects the amount of alcohol in the blood in mg/L[4].

Ethyl alcohol is the most commonly used form of alcohol as an excipient in pharmaceutical formulations. It is the second most commonly used solvent after water in liquid formulations. Ethyl alcohol is also an antimicrobial agent with bacteriostatic, bactericidal and fungicidal activity[5]. It is a substance used in oral care products, sprays, and mouthwashes due to its antibacterial activity. Ethanol remaining in the mouth after the use of aforementioned products may cause false positive results in the breath alcohol test.

In a study conducted by Bonda F. et al. in Italy, breath alcohol levels were measured after the use of mouthwashes known to contain ethyl alcohol. Since the legal limit for ethyl alcohol in traffic in Italy is 0.5 promil, evaluations were made based on this value. It was observed that the measurements made at the 10th minute were significantly different from the ones made at the 0th minute and the alcohol was eliminated from the breath within 10 minutes. In that study, there was no significant difference between the measurements made after mouthwash use between men and women[6]. Additionally, they concluded that there was no significant difference between the measurements made after spray use between men and women, which is similar to our results.

Karabulut D. Y. et al. found no significant correlation between the BAC with the BMI and age in the breath alcohol test performed with shaving cologne, mouthwash and mouth spray. They observed that the BAC value was higher at the 5th minute in mouthwash and at the 3rd minute in mouth spray and cologne6. In our study, BAC values were not dependent on the patient's BMI, indicating that the BMI did not affect the BAC value after use of the mouth spray.

In another study with energy drinks, breath alcohol levels immediately after consumption was observed to cause positive results with the effect of alcohol accumulated in the mouth, this positive result was temporary and disappeared after a 15-minute observation period[7].

In their study, Wigmore and Leslie applied 10 mL of a beverage containing 20% alcohol into the mouth of 9 women and 21 men. Subjects either rinsed and spit out or swallowed the alcohol after 10 seconds. The level of alcohol in the mouth was found to be higher in people who spit out by rinsing than in people who swallowed[8].

Fessler et al emphasized that a 15-minute period was needed so that alcohol-based substances such as cough suppressants, mouthwash, and respiratory spray could not leave residual alcohol in the mouth and could not affect the concentration of breath alcohol[9].

Garcia et al. conducted a study to examine the effect of asthma inhalers on breath alcohol and found that all inhalers gave positive results in the breath alcohol test at the first minute, but all of them decreased to zero after 10 minutes[10].

In our Turkey, according to the Highway Traffic Regulation, the measurement should be done by taking

blood samples in traffic accidents resulting in injury and death if measurement with a technical device is not possible due to reasons such as the urgency of the injured person's condition11. For this reason, alcoholmeter may result in erroneous measurements as possible residual alcohol in the mouth affects the measured level. In our study in which oral antiseptic spray was used, the breath alcohol level was below the legal limit in the measurements made after the 3 and 5th minute. On the other hand, the breath alcohol concentration decreased below the legal limit in the measurements made after 10-15 minutes in other studies studying other substances that could affect the measurement of breath alcohol[9,10]. According to the Highway Traffic Regulation (Art. 97/f), in case of objection to the measurement result made with the technical device, no re-measurement is made, objections to the actions taken are made to the relevant courts within the scope of Article 27 of the Misdemeanor Law No. 5326 dated 30/3/2005[12]. Changing this regulation to make measurements at 5-minute intervals in case of objection will prevent possible wrong evaluations. It is clear that two consecutive positive test results are possible only if there is ethanol in the bloodstream.

Limitations

Our study has several limitations. It was a single-center study with a limited number of patients. Multinational studies with more patients are needed on this subject.

Conclusion

BAC values are only affected by alcohol remaining in the oral cavity from the mouth spray, which explains why the rate of BAC decline is really important. Even if a mouth spray can change the result of a single alcoholmeter test, a simple protocol based on two samples with 5 minutes intervals can eliminate this disadvantage.

The results of the current study suggest that mouth spray containing a significant amount of alcohol will justify a positive alcohol test. Therefore, the use of alcohol-containing drugs at traffic controls should be questioned and a waiting period should be defined in order to prevent the unjust treatment in cases of use.

ORCID IDs

Yeşim İşler: orcid.org/0000-0002-6389-5361
Halil Kaya: orcid.org/0000-0003-2005-6100
Melih Yüksel: orcid.org/0000-0002-0793-3693
Mehmet Oğuzhan Ay: orcid.org/0000-0003-1061-5327
Mehtap Bulut: orcid.org/0000-0003-2131-9099

References

1. Akgür SA, Ertas H, Altıntoprak AE, Ozkan M, Kitapcıoglu G: Prevalence of Alcohol in Blood Samples From Traffic Accident Cases in Turkey. Am J Forensic Med Pathol 2011,32: 136-9.
2. Uysal C, Karapirli M, Inanici MA: Effects of some of the regional Turkish fermented foods and medications on respiratory alcohol levels. Turk J Med Sci 2014, 44:720–27.
3. Foglio-Bonda PL, Poggia F, Foglio-Bonda A, Mantovani C, Pattarino F, Giglietta A. Determination of breath alcohol value after using mouthwashes containing ethanol in healthy young adults. Eur Rev Med Pharmacol Sci. 2015;19(14):2562-66.
4. Dasgupta A: Methods of alcohol measurement. Alcohol, Drugs, Genes and the Clinical Laboratory 2017, 155–66
5. European Medicines Agency: Committee for Medicinal Products for Human Use (CHMP). Information for the package leaflet regarding ethanol used as an excipient in medicinal products for human use. EMA/CHMP/43486/2018.
6. Karabulut D.Y, Özbunar E, Aydoğdu M, Akgür S.A Detection of Breath Alcohol After Using Personal Care Products Journal of Forensic Sciences and Criminal Research 2019 s.22-35
7. Hossain M, Jahan I, Akter S, Hasan MM., Uddin KR., Shawan MMAK., et al. Ethanol content in different energy drinks available in Bangladesh. Jahangirnagar University Journal of Biological Sciences 2017, 5(2): 57.
8. Wigmore JG, Leslie GM. The effect of swallowing or rinsing alcohol solution on the mouth alcohol effect and slope detection of the intoxilyzer 5000. J Anal Toxicol. 2001:25(2):112-14.
9. Fessler CC, Tulleners FA, Howitt DG, Richards JR. Determination of mouth alcohol using the Dräger Evidential Portable Alcohol System. Sci Justice. 2008;48:16-23.
10. Garcia JMI, Barrios JA, Iglesias CH. Influence of asthma inhalers on a breath alcohol test. Med Clin (Barc). 2002;118(9):332-4.
11. Official Gazette No. 26526 18/05/ 2007 Highway Traffic Regulation
12. Official Gazette No. 28918 19/02/2014- Highway Traffic Regulation