

The Alcohol Levels in Fatal & Nonfatal Traffic Accidents in İzmir

İzmir’de Ölümcül ve Ölümcül Olmayan Trafik Kazalarındaki Alkol Düzeyleri

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ABSTRACT Objective: Alcohol is one of the main causes of traffic accidents worldwide and Turkey is one of the European countries showing highest rates for traffic accidents. The study aimed to evaluate the alcohol presence of drivers in fatal and non-fatal injured traffic accidents in İzmir. **Material and Methods:** All samples belonged to samples concerning 348 blood samples from road accident cases between February 2005 and February 2007. From the Traffic Control Department of Head Council of Turkish Police, 10662 drivers in 2007 have been taken as control group. Alcohol analysis was performed in whole blood samples using Head Space-GC. **Results:** 83.6% of the traffic accidents were non-fatal, 16.4% of them were fatal. Alcohol was detected in 37% of all traffic accidents, 54.4% of fatal accidents and 34 % of non-fatal injured traffic accidents. 94.5% out of the 291 samples analyzed were men and (5.4%) were women. **Conclusion:** In accordance with Turkish laws, subjects were considered to be positive when alcohol blood concentration exceeded 0.50g/l. In this study the value of odds ratio suggests that drivers with alcohol below legal BAC limit (BAC level with 0.21-0.50 g/l) had a 3.8 (95% C.I.= 1.6-9.3) times risk of a fatal accident than the alcohol negative drivers. Lowering legal BAC limits in Turkey is expected to reduce the fatal traffic accidents, in particular, because accidents involving alcohol are more likely to result in fatalities.

Key Words: Ethanol; accidents, traffic; automobile driving

ÖZET Amaç: Trafik kazalarını içeren birçok çalışma göstermiştir ki Avrupa ülkelerinden biri olan Türkiye ve tüm dünyada trafik kazalarının ana nedenlerinde biri alkoldür. Bu çalışmanın amacı, izmirdeki ölümcül ölümcül olmayan trafik kazalarındaki sürücülerdeki alkol varlığının değerlendirilmesidir. **Gereç ve Yöntemler:** Çalışmaya, Adli Tıp Kurumu (ATK) İzmir Grup Başkanlığı, Kimya İhtisas Dairesi’nde, Şubat 2005-Şubat 2007 tarihleri arasında değerlendirilen 291 yaralanmalı, 57 ölümlü, toplam 348 trafik kazası olgusu ve kontrol grubu olarak İzmir İl Emniyet Trafik Denetleme Şube Müdürlüğü’nün 2007 Şubat ayı süresince yaptığı denetlemelere katılan 10662 olgu dahil edilmiştir. Trafik denetleme olgularında kan alkol analizi solunum havası incelenerek, Kimya İhtisas Dairesi’nce değerlendirilen olguların kan alkol analizi ise kan incelemesi ile yapılmıştır. İstatistiksel değerlendirme için SPSS 11.00 programı kullanılmıştır. **Bulgular:** 348 trafik kazası olgusunun %37.1’inin (n= 129) kanında alkol saptanmıştır. Yaralanmalı 291 trafik kazasının %33.7’sinde (n= 98) ve ölümlü 56 trafik kazasının %55.4 ünde (n= 31) alkol pozitif bulunmuştur. Trafik Denetleme Şube Müdürlüğü’nden alınan verilere göre trafikte seyreden 10662 araç sürücüsünün %17,6 sında (n= 1874) alkol saptanmıştır. Yaralanmalı ve ölümlü trafik kazalarında, kontrol grubuna göre daha yüksek oranda alkol saptanması istatistiksel olarak anlamlı bulunmuştur. **Sonuç:** Dünyada yapılan bilimsel çalışmalar doğrultusunda, trafikte güvenli sürüşün sağlanması amacıyla trafikte kabul edilebilir kan alkol düzeyininin 0.50 promil (g/L) altına indirilmesi konusunda uluslararası bir eğilim görülmektedir. Çalışmamızda 0.21-0.50 promil arası kan alkol düzeyi saptanan olgularda, ölümlü trafik kazası riskininin alkol saptanmayanlara göre 3.8 kat artmış olması bu görüşleri destekler niteliktedir (P= 0.009).

Anahtar Kelimeler: Etanol; kazalar, trafik; otomobil sürme

It is well known that driving under the influence of alcohol affects driving behaviour in a bilateral way that both reduces driving capability and increases risk-taking. A number of studies have shown that alcohol plays an increasing role in traffic accidents.^{1,2} Alcohol-impaired driving is a significant public health problem and has social and economic consequences as well. Drunk driving has a significant effect on fatal traffic accidents not only for fatality but also for resulting disability in nonfatal traffic accidents. According to the World Health Organization (WHO) reports, traffic accidents related deaths are in the 10th place in developed countries. Turkey is one of the European countries showing highest rates for road accidents. It has been reported that 728.756 road accidents occurred in 2006, with a toll of 4.633 deaths and 92.497 injuries. As third largest city of Turkey, it is reported that İzmir is in the third place regarding the number of injured traffic accidents and in the 5th place in fatal traffic accidents in Turkey. The Law that controls driving under the influence (DUI) of alcohol in Turkey is the Turkish Road Traffic Law/Related Legislation-Prohibition for DUI of alcoholic beverages, narcotics and euphoric substances. Section 97: "Impaired individuals by using narcotics and euphoric substances and alcoholic beverages are prohibited for driving under the influence of these substances on roads". In accordance with Turkish laws, subjects were considered to be positive when alcohol blood concentration exceeded 0.50 g/l. The objective of this study has been to evaluate the alcohol presence in fatal and nonfatal traffic accidents in Izmir in Turkey.

MATERIAL AND METHODS

The Toxicology Laboratory -Chemistry Specialization Department of the Ministry of Justice Izmir Group Directory of Forensic Medicine is the authorized laboratory to perform the medicolegal investigation of the traffic accidents that happen in the Aegean region of Turkey. The cases correspond to samples referred to the laboratory by doctors or as instructed by the judge.

The study consisted of drivers involved in traffic, fatal (n= 57) and nonfatal (n= 291), accidents that occurred within the jurisdiction of our Department (According to scene investigation document and autopsy reports drivers were selected, passengers were not included). 348 blood samples were taken from road accident cases between February 2005 and February 2007 in İzmir. The data available in each case was gender and time of the accident. Samples of venous blood were taken within two hours in injured traffic accident cases, in autopsy cases the intracardiac blood was taken at the autopsy. In autopsy cases, according to autopsy procedure the body was protected in cold conditions and within 24 hours the autopsy was taken.

Alcohol analysis was performed in whole blood samples using Head Space- GC (Perkin Elmer Clarus 500) SGE ID-BP20 colon (60 M x 0.53 mm), Flame Ionization Dedector (FID). A sample was considered positive for alcohol when blood alcohol concentration was over 0.05 g/l. There are different legal limits around world, for example BACs 0.00, 0.20, 0.50 and 0.80 g/l in Hungary, Sweden, Germany and UK respectively. These values were used in present study as the target points at which fatal or nonfatal traffic accidents would be occurred. Alcohol concentrations were classified in seven levels; level 1 (0.00 g/l), level 2 (0.01-0.20 g/l), level 3 (0.21-0.50 g/l), level 4 (0.51-0.80 g/l), level 5 (0.81-1.00 g/l), level 6 (1.01-2.00 g/l) and level 7 (over 2.01 g/l). From the Traffic Control Department of Head Council of Turkish Police 10662 drivers in 2007 has been taken as a control group. Their alcohol analyses were performed in breath air, which is converted to the corresponding blood alcohol concentration (BAC) by multiplying by a BAC/BrAC ratio. Lion Alcohol Meter SD-400 breath alcohol analyzers assume a constant BAC/BrAC ratio of 2100 for this conversion.

Data was processed with SPSS 11.0 and Statcalc EpiInfo version 6 computer program using standard statistical methods. *P*-Values: 0.05 were considered to be significant.

RESULTS

Three hundred thirty two (95.4%) out of the 348 samples analysed were men and 16 (4.6%) were women. The prevalence of alcohol in woman was significantly lower than males, in male 38.6% and in female 6.3% was positive for alcohol (Pearson X^2 , $P= 0.009$) (Table 1).

Alcohol was detected 37% of all traffic accident cases, 54.4% of fatal traffic accident cases (FTACs) and 34% of nonfatal traffic accident cases (NFTACs). In drivers from traffic control cases (TCCs) under suspicion of driving under the influence of alcohol, the incidence of alcohol was 17.6 % (n= 1874).

The mean alcohol concentrations of alcohol positive cases were given in (Figure 1). The mean blood alcohol level of alcohol positive cases in fatal traffic accidents (1.27 g/l \pm 0.82) was higher than control group drivers (0.68 g/l \pm 0.65) ($t= 4.93$, $p< 0.001$). The mean blood alcohol level of alcohol positive cases in non-fatal traffic accidents (1.34 g/l \pm 0.75) was higher than control group drivers (0.68 g/l \pm 0.65) ($t= 9.67$, $p< 0.001$).

The odds ratio (ORs) of activity for BAC was calculated versus traffic control in fatal traffic accidents were given in (Table 2). In this study the value of ORs suggests that drivers with alcohol below legal BAC limit (BAC level with 0.21-0.50 g/L) had a 3.8 (95% C.I.= 1.6-9.3) times risk of a fatal accident than the alcohol negative drivers (Pearson X^2 , $P= 0.009$). The ORs significantly increased with the increasing level of blood alcohol concentration (Statcalc EpiInfo version 6, $p< 0.0001$).

TABLE 1: Alcohol presence in traffic accident groups according to the gender.

| Gender | | NFITCs | | FTCs | | Total | |
|--------|------------------|--------|-------|------|-------|-------|-------|
| | | N | % | N | % | N | % |
| Male | Alcohol positive | 97 | 35 | 31 | 56 | 128 | 38 |
| | Alcohol negative | 179 | 65 | 25 | 44 | 204 | 62 |
| | Total | 276 | 100 | 56 | 100 | 332 | 100.0 |
| Female | Alcohol positive | 1 | 6.6 | 0 | 0.0 | 1 | 6.2 |
| | Alcohol negative | 14 | 93.4 | 1 | 100.0 | 15 | 93.8 |
| | Total | 15 | 100.0 | 1 | 100.0 | 16 | 100.0 |

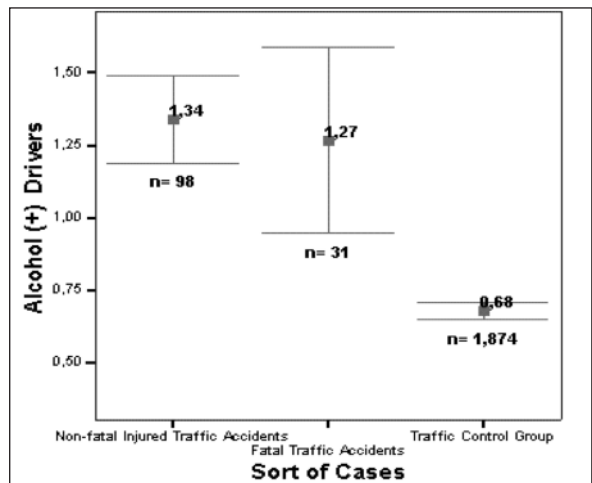


FIGURE 1: The mean alcohol concentrations (g/l) of alcohol positive cases.

The odds ratio of activity for BAC was calculated versus traffic control in all traffic accidents were given in (Table 3).

During nighttime period (Between 18:00 and 06:00 hours), the proportion of fatally injured alcohol positive drivers (56.3%) was significantly

TABLE 2: The odds ratio of activity for BAC's in fatal traffic accidents.

| Alcohol in g/l | Number of cases n (%) | Controls n (%) | Fatal n (%) | OR (95% CI) | P |
|----------------|-----------------------|----------------|-------------|-----------------|--------|
| 0.00 | 8814 (82.2) | 8788 (99.7) | 26 (0.3) | 1 | |
| 0.01-0.20 | 476 (4.4) | 474 (99.6) | 2 (0.4) | 1.4 (0.34-6.03) | 0.65 |
| 0.21-0.50 | 540 (5.0) | 534 (98.9) | 6 (1.1) | 3.8 (1.6-9.3) | 0.009 |
| 0.51-0.80 | 293 (2.7) | 289 (98.6) | 4 (1.4) | 4.8 (1.7-14) | 0.013 |
| 0.81-1.00 | 154 (1.4) | 151(98.1) | 3 (1.9) | 6.3 (1.9-20.4) | 0.015 |
| 1.01-2.00 | 342 (3.2) | 333(98.4) | 9 (2.6) | 9.1 (4.3-19.7) | <0.001 |
| 2.01 | 100 (0.9) | 93 (93) | 7 (7) | 25.4 (10.8-6.1) | <0.001 |

TABLE3: The odds ratio of activity for BAC's in all traffic accidents.

| Alcohol in g/l | Number of cases n (%) | Controls n (%) | Traffic Accident n (%) | OR (95% CI) | P |
|----------------|-----------------------|----------------|------------------------|-------------------|--------|
| 0.00 | 9007 (81.8) | 8788 (97,6) | 219 (2,4) | 1 | |
| 0.01-0.20 | 481 (4. 4) | 474 (98.5) | 7 (1.5) | 0.6 (0.28–1.23) | 0.170 |
| 0.21-0.50 | 551 (5.0) | 534 (96.9) | 17 (3.1) | 1.3 (0.77–2.11) | 0.322 |
| 0.51-0.80 | 303 (2.8) | 289 (95.4) | 14 (4.6) | 2.0 (1.15-3.49) | 0.012 |
| 0.81-1.00 | 164 (1.5) | 151 (92.7) | 13 (7.9) | 3.3 (1.83–5.83) | <0.001 |
| 1.01-2.00 | 381 (3.5) | 333 (86.5) | 52 (13.5) | 6.3 (4.54–8.64) | <0.001 |
| 2.01 | 119 (1.1) | 93 (89.2) | 26 (21.8) | 11.2 (7.12–17.69) | <0.001 |

higher than the control group alcohol positive drivers (19.8%) (Pearson X^2 , $P < 0.001$). In daytime period (between 06:00 and 18:00 hours), the proportion of fatally injured alcohol positive drivers (25.0%) was higher than the control group, but it was non-significant (Figure 2).

During nighttime period, the alcohol presence in all traffic accidents (52.5%) was higher than the control group alcohol (19.8%) (Pearson X^2 , $P < 0.001$). In daytime period, the alcohol presence in all traffic accidents (8.0%) was higher than the control group (3.0%) (Figure 3).

DISCUSSION AND CONCLUSION

Turkey, as mentioned earlier, is one of the European countries which have a high incidence of road traffic accidents. In this regard, this epidemiological study carried out by Ministry of Justice Izmir Group Directory of Forensic Medicine, showed how often alcohol is detected among drivers involved in road accidents in İzmir. Epidemiological studies are useful to assess the role of a number of risk factors in a large population. It determines how frequently a risk factor in the population of drivers occurs and its likely role through statistical techniques.³

The prevalence of alcohol in woman was significantly lower than males, in male 38.6% and in female 6.3% was positive for alcohol. In Turkey consumption of alcohol is widespread particularly in men and among the drivers 84% are men according to Traffic Accidents Statistics.

Alcohol was detected in 37% all traffic acci-

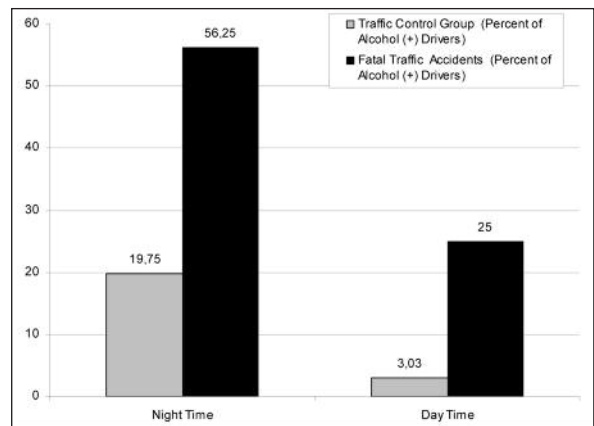


FIGURE 2: The proportion alcohol positive drivers in fatally injured and traffic control group according to the time.

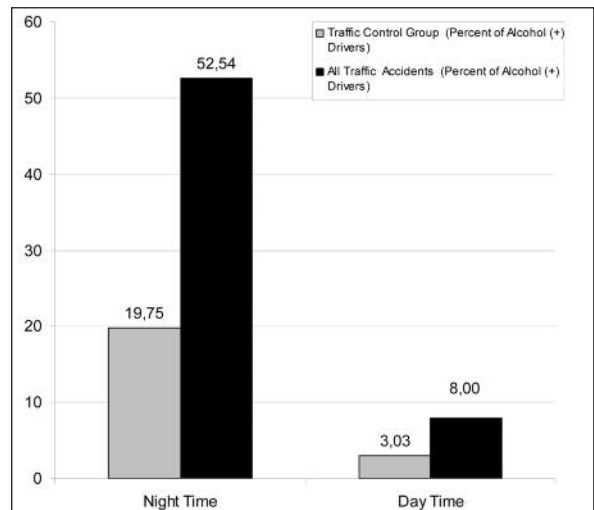


FIGURE 3: The proportion alcohol positive drivers in all traffic accidents and traffic control group according to the time.

dents, 54% in FTACs and 34% in NFTACs. This prevalence in fatal accidents was compatible with USA (40%),⁴ China (42%)⁵ and Spain (51%).⁶ In

Sweden the legal limit for alcohol is 0.2g/l and the prevalence in fatal accidents was 21.8%.⁷ In fatal and nonfatal traffic accidents evaluated together, this prevalence was 50% in Spain,⁶ 49% in Italy,⁸ 27% in Sweden⁹ and 29% in Greece.¹⁰

During the past few decades a number of scientific evidence on driving simulator and roadway studies have established that even small amounts of alcohol adversely affect driving skills and performance.^{2,11-14} In this study the odds ratio significantly increased with the increasing level of blood alcohol. This indicates how much risk of an accident is increased by alcohol. Lowering legal BAC limits is expected to reduce fatal and non fatal traffic accidents. Many industrialized nations currently have legal BAC limits of 0.05 or lower, including Australia, Austria, Belgium, Bulgaria, Croatia, Denmark, Finland, France, Germany, Greece, Israel, Italy, the Netherlands, Portugal, South Africa and Spain have 0.50 g/L, Norway, Russia, and Sweden have a limit of 0.20 g/L BAC, and Poland 0.30 g/L BAC.¹⁵ The official limit is reported to be 0.00 g/l in the Czech Republic, Hungary, Malaysia, Romania, Saudi Arabia, and Japan.² Chamberlain and Solomon (2002) conducted an extensive review of all of the issues surrounding a 0.05 BAC limit. The review summarized the effects of low doses of alcohol on driving behavior, the relative risk of a crash at various BAC levels, and the experience in

other countries with lowering BAC limits, and presented a compelling case for a 0.50 BAC limit.^{1,2}

Introducing or lowering the legal limits of blood alcohol concentration (BAC) levels has proved to be effective in reducing drunk driving and alcohol related traffic accidents.¹⁶⁻¹⁸

Leading medical, crash prevention, public health, and traffic safety organizations in the world support BAC limits at 0.05 or lower, including the World Medical Association, the American and British Medical Associations, the European Commission, the European Transport Safety Council, the World Health Organization, and the American College of Emergency Physicians.²

As a conclusion, firstly our study shows how often alcohol is detected (54%), in the blood samples taken from fatally injured drivers in Izmir in Turkey. Secondly, in a high percentage 26% of cases blood alcohol levels were under those permitted in car drivers by law (0.50 g/l) and the value of ORs suggests that drivers with BAC level with 0.21-0.50 g/L had a higher risk of a fatal accident than the alcohol negative drivers. When all of the international evidence on lowering BAC limits is reviewed, and our study results summarized, we can say that lowering the legal BAC limit would be an effective strategy on reducing traffic accidents in Turkey.

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