Factors Associated with Fatal Traffic Accidents in Tirana, Albania: Cross-sectional Study

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Aim To assess the prevalence of fatal road traffic accidents in Tirana, Albania, and describe their determinants.

Methods This cross-sectional study included all road traffic accidents recorded by the Traffic Police Department of Tirana district for the period 2000-2005. A structured questionnaire included information about the type of traffic accident (fatal vs non-fatal event), year of event, age and sex of the responsible party, reason of accident, location and time of event, and the type of vehicle involved. Multivariable-adjusted binary logistic regression analysis was used to assess the predictors of fatal road traffic accidents.

Results Overall, there were 1578 recorded road traffic accidents in Tirana district during 2000-2005. Of these, 272 (17%) were fatal. Multivariable-adjusted models showed that younger age (OR, 3.97; 95% CI, 2.28-6.91), high speed (OR, 2.54; 95% CI, 1.62-3.98), and especially alcohol consumption (OR, 6.15; 95% CI, 3.54-10.66) were strong and significant predictors of fatal accidents. Fatal accidents were more prevalent on intercity roads (OR, 4.25; 95% CI, 3.11-5.82) and involved especially vans and trucks (OR, 4.12; 95% CI, 2.34-7.24).

Conclusion Young age, high speed, and alcohol are predictors of fatal road traffic accidents in Tirana district. These findings can serve as a basis for health care professionals and policymakers to create preventive measures for traffic accidents.

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.Road traffic accidents are a major public health problem worldwide, accounting for almost 1.2 million deaths per year (1). In 2002, the overall global road traffic injury rate was 19/100 000 population, with 90% of cases in low-income and middle-income countries (1). Furthermore, according to the World Health Organization, the number of road traffic deaths in low-income and middle-income countries is expected to increase by 80% from 2000 to 2020 (1). The design and conditions of roads and road networks (1-3), excess and inappropriate speed (1,3,4), young drivers (1,5), consumption of alcohol (1,4-6), no use of helmets (1,7,8) and seat-belts (1,9), as well as the unavailability of air bags (9,10) have all been reported as major determinants of road accidents including fatal events. However, data from transitional countries of Southeast Europe, including Albania, are sparse and there is a lack of research agenda on road safety in low-income and middle-income countries (11).

Mortality rates from road traffic accidents have increased significantly in Albania since the early 1990s, when the transition to the market economy took place (12,13). In that period the number of vehicles increased from 20 513 in 1990 to 129 671 in 1993, to 274 652 in 2004 (14). Although Albania is still considered to have the lowest traffic density in the region (15), mortality rates from road traffic accidents have exceeded the rates in the European Union since 1992 (15). Furthermore, Albania is a country with a very high fatality rate (0.68 deaths per accident) primarily due to poor roads and irresponsible driving (12). The situation is particularly problematic in the Tirana district, the population of which has increased from 329 228 in 1989 to 597 040 in 2004 (14). Nevertheless, there is no systematic evidence about the exact magnitude and determinants of road traffic injuries in Albania.

In this context, we decided to describe the prevalence and determinants of fatal road traffic accidents during 2000-2005 in Tirana district, which in the past 15 years has been undergoing a rapid, although not well-documented, increase in the number of cars.

Methods

Study design and setting

This cross-sectional study was conducted in Tirana and included all recorded road traffic accidents in the register of the Traffic Police Department in Tirana for the period 2000-2005. The register covers all road traffic accidents occurring within Tirana district. There was no evidence of local geographical differences in the recording system for the period under study (2000-2005).

Data collection

According to the definition of the Traffic Police Department in Tirana, a road traffic accident is considered to be any event of human injury and/or death as a consequence of a physical collision between a responsible party (motor vehicle including motorcycle, car, van or truck, and/or bicycle) and an injured/damaged party (motor vehicle(s); bicycle(s)/bike(s); pedestrian(s); or any physical object, eg, building or tree).

In cases when the crash involves a motor vehicle and/or bicycle with pedestrians, the information about the driver/rider of the motor vehicle/bicycle (age, sex, alcohol consumption, speed, type of motor vehicle) is recorded at the Traffic Police Department in Tirana, regardless of the responsible party. When the crash involves two motor vehicles, the record is made only for the responsible party.

A structured questionnaire, entirely based on the forms of the Traffic Police Department in Tirana, included information about the following covariates: 1) type of road traffic accident (fatal vs non-fatal event – the later re-

ferred to as injury, as determined by the Traffic Police Department at the time of event, regardless of hospital care); 2) year of event in the study period; 3) socio-demographic determinants (age and sex) of the responsible party; 4) reason of road traffic accident as recorded in the police forms (pedestrian carelessness, irresponsible driving, high speed, or alcohol consumption); 5) location of event (within city, intercity roads); 6) time of the event (morning hours, afternoon, or overnight); and 7) the type of vehicle involved (bicycle, motorcycle, car, or van or truck).

Statistical analysis

Binary logistic regression was used to assess the association of fatal road traffic accidents with socio-demographic determinants of the responsible party (age and sex), year of the event, reason of accident, time of the event, location of the event, and type of vehicle involved. Age-adjusted odds ratios (OR) with 95% confidence intervals (CI) and *P* values were calculated. $P \leq 0.05$ was considered statistically significant. Subsequently, all covariates were entered into the logistic models (with fatal road traffic accidents as the dependent variable) and removed in a backward stepwise procedure if their *P* value exceeded 0.10. Twenty-three cases were dropped from the multivariable-adjusted logistic model due to missing covariate values (age and sex of the driver/rider, reason of accident, and time and location of event). Multivariable-adjusted OR with 95% CI and *P* values were calculated. The Hosmer-Lemeshow test was used to assess goodness-of-fit (16). All statistical analyses were performed with Statistical Package for the Social Sciences, version 11.0 (SPSS Inc., Chicago, IL, USA).

Table 1. Age-adjusted association of fatal road traffic accidents with investigated risk factors in Tirana, 2000-2005

Variable	Accidents		OR (95% CI)*	*P*
	non-fatal (n = 1306)	fatal (n = 272)		
Age (years):				<0.001 (2)†
≤25	433 (33.2)	131 (48.2)	3.87 (2.30-6.49)	<0.001
26-45	641 (49.2)	123 (45.2)	2.45 (1.46-4.11)	0.001
≥46	230 (17.6)‡	18 (6.6)	1.00 (reference)	–
Linear trend:				<0.001
Sex:				
men	1225 (93.9)	250 (91.9)	1.00 (reference)	–
women	80 (6.1)	22 (8.1)	1.39 (0.84-2.28)	0.199
Year of accident:				<0.001 (5)
2000	162 (12.4)	51 (18.8)	1.00 (reference)	–
2001	156 (11.9)	52 (19.1)	1.10 (0.70-1.72)	0.690
2002	192 (14.7)	46 (16.9)	0.79 (0.50-1.24)	0.301
2003	280 (21.4)	35 (12.9)	0.40 (0.25-0.65)	<0.001
2004	274 (21.0)	50 (18.4)	0.60 (0.39-0.93)	0.023
2005	242 (18.5)	38 (14.0)	0.50 (0.32-0.81)	0.004
Reason of accident:				<0.001 (3)
pedestrian carelessness	324 (24.8)	32 (11.8)	1.00 (reference)	–
irresponsible driving	491 (37.7)	84 (30.9)	1.69 (1.10-2.61)	0.018
high speed	389 (29.8)	108 (39.7)	2.68 (1.75-4.09)	<0.001
alcohol consumption	100 (7.7)	48 (17.6)	5.09 (3.07-8.45)	<0.001
Location of accident:				
within the city	1127 (86.7)	163 (59.9)	1.00 (reference)	–
intercity roads	173 (13.3)	109 (40.1)	4.06 (3.02-5.45)	<0.001
Time of event:				0.283 (2)
morning hours	352 (27.1)	61 (22.4)	1.00 (reference)	–
afternoon	678 (52.1)	147 (54.0)	1.23 (0.89-1.71)	0.209
overnight	271 (20.8)	64 (23.5)	1.35 (0.92-2.00)	0.127
Type of motor vehicle:				<0.001 (2)
motorcycle/bicycle	209 (16.2)	20 (7.4)	1.00 (reference)	–
car	799 (62.1)	164 (60.3)	2.42 (1.47-3.97)	<0.001
van/truck	279 (21.7)	88 (32.4)	4.04 (2.38-6.86)	<0.001

*Age-adjusted (introduced as continuous variable) odds ratios (OR) (fatal vs non-fatal accidents) and 95% confidence intervals (CI) from binary logistic regression analysis.
†Overall *P* value and degrees of freedom (in parentheses).
‡Number and column percentages (in parentheses). Discrepancies in totals are due to missing covariate values.

Results

Overall, there were 1578 recorded episodes of road traffic accidents in Tirana district from 2000 to 2005 (Table 1). The number of road traffic accidents increased from 213 in 2000 to 315 in 2003 and 324 in 2004, but decreased to 280 in 2005. Of 1578 road traffic accidents, there were 272 (17%) fatal events (Table 1). Age of the responsible party was inversely and consistently related to fatality of episodes (*P* for linear trend: <0.001). Surprisingly, women were more likely to perpetrate fatal road traffic accidents than men, although this finding was not statistically significant (age-adjusted OR, 1.39; 95% CI, 0.84-2.28). There was a significant drop in case-fatality rate for the period 2003-2005 compared with 2000-2001. Irresponsible driving (OR, 1.69; 95% CI, 1.10-2.61), high speed (OR, 2.68; 95% CI, 1.75-4.09), and alcohol consumption (OR, 5.09; 95% CI, 3.07-8.45) were all strongly and significantly associated with fatal events (Table 1). Furthermore, fatal road accidents were much more prevalent on intercity roads than within the city (OR, 4.06; 95% CI, 3.02-5.45). There was a higher case-fatality rate for road traffic accidents involving cars (OR, 2.42; 95% CI, 1.47-3.97) and vans or trucks (OR, 4.04; 95% CI, 2.38-6.86) than motorcycles/bicycles (Table 1).

After adjustment for all covariates in a backward stepwise manner, there was an inverse and strong linear association of fatal road traffic accidents with age of the responsible party (OR, 3.97; 95% CI, 2.28-6.91 for ≤25 years vs ≥46 years) (Table 2). Similarly, the strong positive associations with reason of accident (irresponsible driving, high speed, and alcohol consumption), location of accident (intercity roads) and type of motor vehicle (car and van/truck) remained unaffected (Table 2).

We showed an interaction between age of the responsible party and reason of accident (*P* for interaction = 0.019). Young drivers (≤25 years) who used alcohol or drove too fast had a particularly high case-fatality rate (alcohol use vs pedestrian carelessness multivariable-adjusted OR, 16.7; 95% CI, 6.0-46.8 and high speed vs pedestrian carelessness OR, 4.0; 95% CI, 1.7-9.3; not shown in the tables).

Table 2. Association of fatal road traffic accidents (n = 1555) with selected risk factors; multivariable-adjusted odds ratios (OR) from binary logistic regression

Variable	OR* (95% confidence intervals)	*P*†
Age:		<0.001 (2)
≤25 y	3.97 (2.28-6.91)	<0.001
26-45 y	2.38 (1.38-4.12)	0.002
≥46 y	1.00 (reference)	–
Year of accident:		<0.001 (5)
2000	1.00 (reference)	–
2001	1.30 (0.80-2.13)	0.287
2002	0.94 (0.58-1.54)	0.813
2003	0.44 (0.26-0.73)	0.001
2004	0.58 (0.36-0.96)	0.032
2005	0.58 (0.34-0.97)	0.036
Reason of accident:		<0.001 (3)
pedestrian carelessness	1.00 (reference)	–
irresponsible driving	1.67 (1.06-2.63)	0.026
high speed	2.54(1.62-3.98)	<0.001
alcohol consumption	6.15 (3.54-10.66)	<0.001
location of accident:		
within the city	1.00 (reference)	–
intercity roads	4.25 (3.11-5.82)	<0.001
Type of motor vehicle:		<0.001 (2)
motorcycle/bicycle	1.00 (reference)	–
car	2.55 (1.51-4.30)	<0.001
van/truck	4.12 (2.34-7.24)	<0.001

*All the variables presented in the table together with sex (men vs women) and time of event (morning hours, afternoon, and overnight) were included in a backward stepwise elimination procedure with a *P*-value to exit >0.10. Sex and time of event were excluded from the logistic model. Twenty-three cases were dropped from the model due to missing covariate values.
†Overall *P* value and degrees of freedom (in parentheses).

Discussion

Our study demonstrated a strong positive association between fatal road traffic accidents and younger age, high speed, and alcohol consumption of the responsible party in a low-income country, such as Albania, in social and economic transition. Furthermore, fatal events were more prevalent in intercity roads and involved especially vans/trucks.

We were not able to calculate the incidence rate and/or mortality rate in road traffic accidents for each year of survey, because there was no complete information on the population of Tirana district in that period. Only avail-

able data are for Tirana population in 2001 (522 259 inhabitants) and 2004 (597 040 inhabitants) (14). The overall rate (per 100 000 population) of road traffic accidents has increased in Tirana district from 39.8 in 2001 to 54.3 in 2004, whereas the mortality rate (per 100 000 population) has slightly decreased (9.9 in 2001 vs 8.4 in 2004). On the other hand, case fatality rate has substantially decreased in 2003-2005 (overall: 22.6%) since 2000-2002 (overall: 13.4%). In the absence of more persuasive data, we presume that the increase in the overall rate of road traffic accidents in 2004, compared with 2001, may be attributed to the increase in the number of vehicle users. On the other hand, the decrease in case-fatality rate, for which we have evidence for the whole period of study, may be attributed to the improvement of quality of roads and road networks in Tirana district, as well as the improvement of quality of the vehicles used. It is tempting to conclude that policies on alcohol restriction, use of helmets, and education of road users on road safety have also improved in 2003-2005 compared with 2000-2002; yet, the information on such preventive measures is scant. Also, there is no evidence that an improvement of emergency care and, therefore, quality of pre-hospital care does not play a role in the decrease.

Positive relationship of fatal events with younger age of drivers in our study is in accordance with reports from other countries that young drivers/riders have a higher crash risk and a higher fatality rate than older drivers/riders (1,5).

As expected, drivers who consumed alcohol had a significantly higher risk of fatal crashes. This finding is also consistent with the reports indicating that consumption of alcohol is an important risk factor for overall traffic injuries and fatal events (1,4-6).

High speed was another major determinant of fatal road traffic accidents in our study. The speed of motor vehicles has been strongly related to road injuries, influencing both the crash risk and crash consequences (1,3,4). It is estimated that in high-income countries excess and inappropriate speed contributes to around 30% of fatal crashes (1).

We found a significant interaction between the age of the responsible party and reason of accident. This is consistent with previous studies, which have indicated a strong relationship between alcohol use and young age of drivers (5).

The higher case-fatality rate of road traffic accidents in women (Table 1) was not significant and, therefore, should be interpreted with caution. Yet, notwithstanding the lack of significance, the relationship deserves further attention. At this stage, in the absence of more persuasive data from Albania, we do not offer an explanation other than chance. However, US women have also been reported to have a higher death rate in road crashes than men (4).

In our study, the time of event was not significantly associated with case-fatality rate, although in age-adjusted analysis there was an excess risk for road traffic accidents occurring overnight (Table 1).

The crash case-fatality rate was significantly higher on intercity roads than within the city. This is to be expected given the inappropriate design of intercity roads in Albania, which place both drivers and pedestrians at a particularly high risk for traffic injuries.

We found a higher case-fatality rate for cars and trucks than for motorcycles/bicycles. This finding, which deserves further investigation, points to an urgent need for improving the safety measures of such means of transportation. It has been reported that buses and trucks are frequently involved in traffic accidents in low-income and middle-income countries (1,17). In such countries, second-hand buses and trucks are often imported without

the crash-protective equipment (1,17). Furthermore, such vehicles have a poor crashworthiness performance and a poor stability when overloaded (1,17), as it is frequently the case in Albania.

The number of road traffic accidents in Tirana was higher in 2003-2005 than in 2000-2002, which is in line with the assumed increase in the number of cars and traffic density (12). Nonetheless, the case-fatality rate has decreased significantly over the study period. The decline in case-fatality rate from road accidents in Tirana for the period 2003-2005 compared to 2000-2001 is similar to the trend observed in some other countries in Southeast Europe, such as Croatia, Romania, and Moldova (15). Yet, death rates in road traffic accidents remain higher than the European Union average in most countries of Southeast Europe, which raises concerns, especially when considering the significant lower traffic density in this region (15).

Our study has several limitations. Records of road traffic accidents from the Traffic Police Department in Tirana provide a single reason for the accidents (pedestrian carelessness, irresponsible driving, high speed, or alcohol consumption). This could prevent us from taking into account combinations of various possible reasons. For example, irresponsible driving and/or high speed are significantly more frequent among drivers who use alcohol (1,4-6).

Furthermore, records from the Traffic Police Department do not include important information on the use of seat-belts or helmets, which would enable the assessment of impact of these measures on the prevention of fatal events (1,7-9). In addition, police records do not provide information on weather conditions, visibility situation, design and quality of roads and road networks, as well as the exact time of events, which all influence the occurrence and fatality rate of road traffic accidents (1-3). Our data could have been affected by underreporting of traffic injuries, especially non-fatal events involving high-speed drivers or those who use alcohol. However, there seems to be no overt reason for differential recording of non-fatal road traffic accidents, although we cannot rule out such a possibility. Finally, we do not have data on Tirana population for each year of the study to correctly estimate the rates of road traffic accidents. It should be noted that Tirana is characterized by an intensive process of both internal and external migration (18), which makes it difficult to obtain accurate figures of its population size.

Notwithstanding these limitations, we believe that our study provides useful evidence on the magnitude and determinants of fatal road traffic accidents in Tirana. In order to decrease and prevent the burden of road traffic injuries, education programs targeting especially young road users, including drivers, riders, and pedestrians, should be implemented. Furthermore, establishment of a long-term national strategy on road safety, including an effective surveillance system, can significantly help to control and prevent road traffic injuries (1). In conclusion, health care professionals and policymakers should be aware of health and economic impact of traffic injuries in Albania and of the importance of the introduction of preventive measures.

References

1 Peden M, Scurfield R, Sleet D, Mohan D, Hyder AA, Jarawan E, et al, editors. World report on road traffic injury prevention. Geneva: World Health Organization; 2004.

2 European Road Safety Observatory. Road safety management. 2006. Available from: *http://www.erso.eu/knowledge/fixed/10_rsm/RSM.pdf.* Accessed: 28 January, 2008.

3 Laflamme L, Vaez M. Car crash and injury among young drivers: contribution of social, circumstantial and car attributes. Int J Inj Contr Saf Promot. 2007;14:5-10. Medline:17624005 doi:10.1080/17457300601119031

4 Bedard M, Guyatt GH, Stones MJ, Hirdes JP. The independent contribution of driver, crash, and vehicle characteristics to driver fatalities. Accid Anal Prev. 2002;34:717-27. Medline:12371777 doi:10.1016/S0001-4575(01)00072-0

5 Zador PL, Krawchuk SA, Voas RB. Alcohol-related relative risk of driver fatalities and driver involvement in fatal crashes in relation to driver age and gender: an update using 1996 data. J Stud Alcohol. 2000;61:387-95. Medline:10807209

6 Ahlm K, Eriksson A. Driver's alcohol and passenger's death in motor vehicle crashes. Traffic Inj Prev. 2006;7:219-23. Medline:16990235 doi:10.1080/15389580600727846

7 Attewell RG, Glase K, McFadden M. Bicycle helmet efficacy: a meta-analysis. Accid Anal Prev. 2001;33:345-52. Medline:11235796 doi:10.1016/S0001-4575(00)00048-8

8 Thompson DC, Rivara FP, Thompson RS. Effectiveness of bicycle safety helmets in preventing head injuries. A case-control study. JAMA. 1996;276:1968-73. Medline:8971066 doi:10.1001/jama.276.24.1968

9 Crandall CS, Olson LM, Sklar DP. Mortality reduction with air bag and seat belt use in head-on passenger car collisions. Am J Epidemiol. 2001;153:219-24. Medline:11157408 doi:10.1093/aje/153.3.219

10 Braver ER, Ferguson SA, Greene MA, Lund AK. Reductions in deaths in frontal crashes among right front passengers in vehicles equipped with passenger air bags. JAMA. 1997;278:1437-9. Medline:9356003 doi:10.1001/jama.278.17.1437

11 Perel P, Ker K, Ivers R, Blackhall K. Road safety in low- and middle-income countries: a neglected research area. Inj Prev. 2007;13:227. Medline:17686930 doi:10.1136/ip.2007.016527

12 Ministry of Health of the Republic of Albania. Public health and health promotion strategy: towards a healthy country with healthy people. Tirana: Ministry of Health; 2004.

13 Nuri B, Tragakes E, editors. Health care systems in transition: Albania. Copenhagen: European Observatory on Health Care Systems; 2002.

14 Institute of Statistics of Albania. Albania in figures. Tirana: INSTAT; 2005.

15 Rechel B, McKee M. Healing the crisis: a prescription for public health action in South Eastern Europe. New York (NY): Open Society Institute Press; 2003.

16 Hosmer D, Lemeshow S. Applied logistic regression. New York (NY): Wiley & Sons; 1989.

17 O'Neill B, Mohan D. Reducing motor vehicle crash deaths and injuries in newly motorising countries. BMJ. 2002;324:1142-5. Medline:12003889 doi:10.1136/bmj.324.7346.1142

18 United Nations Development Program. Albanian human development report 2000. Available from: *http://www.al.undp.org/download/pdf/nhdr2000.pdf*. Accessed: 28 January, 2008.