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Injured pedestrians in Cape Town — the role of alcohol

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Objective. To establish a profile of injured adult pedestrians and attempt to define the role which alcohol plays in this regard.

Design. Prospective survey of injured pedestrians who presented consecutively over 9 weeks to Groote Schuur Hospital. Data on fatally injured pedestrians were retrospectively collected from the State Mortuary.

Setting. Hospital-based study conducted at the trauma unit, Groote Schuur Hospital.

Participants. A total of 321 pedestrians — 196 injured and 35 'dead on arrival'.

Main outcome measures. Sociodemographics, blood alcohol concentration (BAC) and injury severity.

Results. Patients were predominantly male and, on average, 35.6 years old. They were most frequently injured at night and over weekends. The BAC was positive in 62.1% of pedestrians, and the mean BAC was 0.19 g/dl. Most pedestrians had at least one lower limb injury and nearly half had a head injury; however, BAC-positive pedestrians were 2.6 times more likely to have a head injury ($P = 0.0009$). Furthermore, BAC-positive pedestrians sustained more severe injuries, more frequently required admission to the ICU, had longer hospital admissions and were more likely to die of their injuries. The overall case fatality rate was 19.5%.

Conclusions. The influence of alcohol intoxication among injured adult pedestrians in Cape Town is high, suggesting that alcohol plays a major role in these accidents. Consequently, there should be some degree of culpability in those who cross the road while in an intoxicated state. However, equal attention should be given to safe and convenient crossing points, good lighting and education with regard to the wearing of reflective clothing after dark.

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Alcohol appears to play a significant role in most traffic-related trauma in South Africa.[1] It has been found to be an attributable factor in 29.1% of non-fatally injured drivers,[2] 47.4% of fatally injured drivers[3] and 61.2% of fatally injured pedestrians.[4] Although multicentric random sample surveys in South Africa show that 10 - 13% of non-injured pedestrians have blood alcohol concentrations (BACs) in excess of 0.08 g/dl,[5] few or no reliable data describing the relationship between alcohol and non-fatally injured pedestrians are available. International reports have, however, indicated that between 30% and 65% of pedestrians are intoxicated at the time of injury.[6-9]

The purpose of this study was to describe the demographic and clinical characteristics of injured pedestrians in Cape Town and to assess what proportion of these injuries are alcohol-related in order to produce data for developing appropriate prevention strategies for pedestrians.

Patients and methods

Data on all injured pedestrians admitted to the trauma unit, Groote Schuur Hospital, Cape Town, were prospectively collected over a 9-week period during May - August 1993. All pedestrians who were injured by a motor vehicle, and who presented to the trauma unit within 6 hours of injury, were included in the study, irrespective of whether they required hospital ward admission or not. Data on all pedestrians who died before reaching hospital over the same time period were also retrospectively gathered from Salt River State Mortuary. Pedestrians injured by trains and bicycles were excluded from the study. Patients under the age of 13 years were excluded since they were treated at a nearby paediatric hospital. The study was approved by the University of Cape Town Ethics Committee and informed consent to blood alcohol analysis, although controversial in intoxicated patients, was obtained where possible.

A total of 231 pedestrians were included in the study — 196 had arrived at hospital alive and 35 had died at the scene of the collision.

Data gathered included demographics, blood alcohol analysis, physiological response to injury, anatomical nature and severity of injuries as well as progress and outcome. Injuries were assessed and scored using the abbreviated injury score (AIS90).[10] The injury severity score (ISS)[11] was calculated for those patients with multiple injuries.

Venous blood was independently analysed at the Cape Town Forensic Chemistry Laboratory of the Department of National Health; BACs were calculated by means of gas chromatography.

Data were analysed by means of SAS version 6 (SAS Institute Inc., Cary, NC, USA, 1990).

Results

BAC was assessed in 227 of the 231 pedestrians — 4 fatally injured pedestrians did not have BAC results documented. One hundred and forty-one patients (62.1%) were found to have positive BACs — 59.5% of patients had BACs at or above 0.08 g/dl (Fig. 1). The mean BAC for all pedestrians tested was 0.12 g/dl (range 0 - 0.39 g/dl), whereas for BAC-positive pedestrians only it was 0.19 g/dl (range 0.03 - 0.39 g/dl).

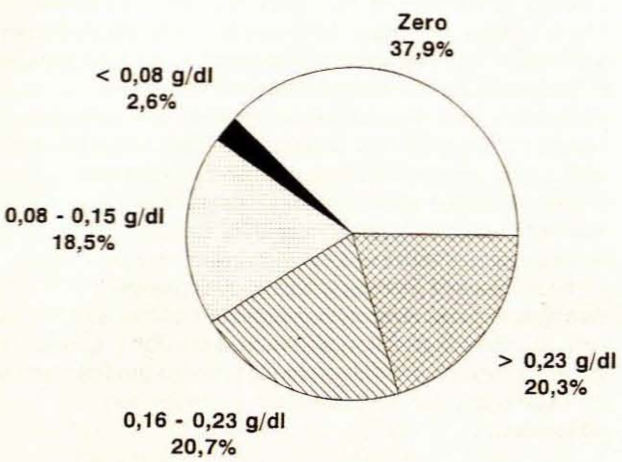

Fig. 1. BAC levels in pedestrians (*N* = 227), where the mean BAC for all pedestrians was 0.12 g/dl and for BAC-positive pedestrians only was 0.19 g/dl.

Men were involved in pedestrian traffic-related trauma more commonly than women (2.3:1). This gender distinction was even more pronounced in those pedestrians who were BAC-positive (3.3:1). The average age of all patients was 35.6 years (range 13 - 77 years); however, more than one-third of patients (33.8%) were in the 20 - 29-year age group.

The number of injuries peaked on Saturdays, particularly in BAC-positive pedestrians, who were 3.4 times more likely to be injured over the weekend (Friday to Sunday) than patients with negative BACs ($P = 0.00002$). Furthermore, nearly three-quarters of all pedestrians were injured between sunset and sunrise, with most collisions taking place between 18h00 and 23h00.

Most pedestrians sustained an injury to the lower limb. Left and right lower limbs were equally involved; however, more than a quarter of patients had bilateral lower limb injuries (Table I). A significant proportion of pedestrians had a concomitant head injury. Those pedestrians who were BAC-positive were 2.6 times more likely to sustain a head injury than their BAC-negative counterparts ($\chi^2 = 10.9$; $P = 0.0009$) (Table I). BAC-positive pedestrians sustained more severe injuries and were two times more likely to sustain polytrauma than their BAC-negative counterparts (Table II).

A greater proportion of BAC-positive patients required admission to a hospital ward (74.2% v. 65.8%); significantly more required admission to an intensive care unit (ICU) ($\chi^2 = 2.7$; $P = 0.09$) (Table III). BAC-positive patients were also more likely to require surgical intervention. As a result of the severity of their injuries and surgical requirements, BAC-positive patients required longer hospital admissions (9.2 days v. 7.7 days on average) and the resultant severity of functional disability incurred by these patients was clinically significant.

Table I. Injuries sustained by all pedestrians

	All ($N = 231$)		BAC+ ($N = 141$)		BAC– ($N = 86$)	
Body region	No.	%	No.	%	No.	%
Head	118	51.1	70	56.0*	28	32.6
Face	66	28.6	42	29.8	22	25.6
Chest	55	23.8	37	26.2	15	17.4
Abdomen	43	18.6	24	17.0	16	18.6
Spine	32	13.9	22	15.6	9	10.5
Arm	65	28.1	45	31.9	18	20.9
Leg	166	71.9	98	69.5	64	74.4

* $\chi^2 = 10.9$; $P = 0.0009$; odds ratio = 2.6.
BAC+ = BAC-positive; BAC– = BAC-negative.

Table II. ISS scores in all pedestrians

	All ($N = 231$)		BAC+ ($N = 141$)		BAC– ($N = 86$)	
ISS	No.	%	No.	%	No.	%
1 - 9	112	48.5	64	45.4	48	55.8
10 - 19	41	17.7	22	15.6	19	22.1
20 - 29	18	7.8	13	9.2	5	5.8
30 +	60	26.0	42	29.8*	14	16.3

* $\chi^2 = 4.54$; $P = 0.003$; odds ratio = 2.18.

Table III. Placement and outcome of injured pedestrians

	All ($N = 196$)		BAC+ ($N = 120$)		BAC– ($N = 76$)	
Placement	No.	%	No.	%	No.	%
Discharged	57	29.1	31	25.8	26	34.2
Admitted						
To ward	110	56.1	66	55.0	44	57.9
To ICU	25	12.8	20	16.7*	5	6.6
Died						
Within 24 h	4	2.0	3	2.5	1	1.3
After 24 h	6	3.1	4	3.3	2	2.6
Required surgery	79	40.3	51	42.5	28	36.8
Functional disability						
None	27	13.8	15	12.5	12	15.8
Short term (< 8 wks)	80	40.8	47	39.2	33	43.4
Long term (≥ 8 wks)	54	27.6	33	27.5	21	27.6
Permanent	25	12.8	18	15.0	7	9.2

* $\chi^2 = 2.7$; $P = 0.09$; odds ratio = 2.67.

Ten pedestrians who were admitted alive to hospital died as a result of their injuries; 7 were BAC-positive. The overall case fatality rate for pedestrians was 19.5%.

Discussion

Road traffic trauma is arguably one of South Africa's most serious and preventable public health problems. Almost 50% of the people who die on South African roads are pedestrians, amounting to 4 500 deaths annually.[12] A further 26 000 pedestrians are injured annually, placing a significant burden on the State as well as on hospital and health care resources. It is estimated that pedestrians injured or killed on the N2 freeway into Cape Town cost Groote Schuur Hospital approximately R1 million annually[13] and that pedestrian deaths alone cost the State about R1 190.3 million annually.[14]

In the Cape Town metropolitan area, the pedestrian trauma problem appears to be appreciably worse than the national average. Here pedestrians constitute a staggering 66% of all traffic deaths.[4] Our data suggest that intoxication is one of the major factors in pedestrian traffic trauma causation in Cape Town, possibly because it impairs a person's ability to judge distances and the speed of approaching vehicles, particularly at night. Alcohol also slows the reflexes, and may result in poor decision-making, particularly with regard to when and where to cross the road. When the approaching driver is also intoxicated, the action necessary to avert a collision may be delayed, with disastrous consequences. Although not documented in this study, serious trauma may also be sustained by the vehicle's occupants. The consequences of a collision may therefore not be limited to the pedestrian victim.

The results obtained in this study are therefore a conservative estimate of alcohol-related pedestrian injuries. More realistic results would have been obtained had BACs been assessed in both the injured pedestrian and the driver of the vehicle. Furthermore, a case-control study such as the one by Haddon *et al.*[15] would be required to define further the role that alcohol plays in pedestrian injury causation.

Despite the obvious limitations of this descriptive study, it provides baseline data and indicates clearly that alcohol plays a significant role in pedestrian injury causation. Consequently, there should be some degree of culpability on the part of pedestrians who cross the road in an intoxicated state. Legislation should cover all road users, not just the drivers of vehicles. Road safety campaigns should be targeted specifically at pedestrians who drink, and the stigma associated with the use of the road while drunk should be similar to that applied to drivers.

However, given that approximately one-third of the pedestrians studied had BACs under 0.08 g/dl, alcohol is clearly not the only problem. Equal attention should be given to safe and convenient crossing points (particularly where a community lives close to a major road) and good lighting. Mass education on the hazards of crossing a road in an intoxicated state, as well as the evaluation of passive prevention strategies such as the wearing of reflective clothing after dark, are also required.

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REFERENCES

1. Van der Spuy JW. Alcohol-related trauma. *CME* 1991; **9:** 859-868.
2. Van Kralingen WN, Whittaker S, van der Spuy J, Smith LS, Stokol JM, Haddow PM. *Alcohol and the Injured Driver: The 'Podder'-Project Conducted at the Groote Schuur Hospital Trauma Unit* (Report DPVT/170). Pretoria: CSIR, 1991.
3. Traffic Department, City of Cape Town. *Year Book: Accidents for 1992*. Cape Town: Traffic Department, 1992.
4. Van der Spuy JW, de Wet B, Abrahams N, Strydom M, Peden MM. The Cape Metropolitan Study — 1990. Cape Town: South African Medical Research Council, National Trauma Research Programme (Unpublished).
5. Directorate of Traffic Safety. Walking the straight and narrow. *Robot* 1990; **5:** 5.
6. Jehle D, Cottington E. Effect of alcohol consumption on outcome of pedestrian victims. *Ann Emerg Med* 1988; **17:** 141-144.
7. Wyss D, Rivier L, Gujer JR, Paccaud F, Magnenat P, Yersin B. Characteristics of 167 consecutive traffic accident victims with special reference to alcohol intoxication: A prospective emergency room study. *Soz Praventivmed* 1990; **35:** 108-116.
8. Galloway DJ, Patel AR. The pedestrian problem: a 12-month review of pedestrian accidents. *Injury* 1982; **13:** 294-298.
9. Brainard BJ, Slauterbeck J, Benjamin JB, Hagaman RM, Higie S. Injury profiles in pedestrian motor vehicle trauma. *Ann Emerg Med* 1989; **18:** 135-137.
10. Joint Committee on Injury Scaling. *The Abbreviated Injury Score*. 1990 Revision (AIS90). Des Plaines, Illinois: Association for the Advancement of Automotive Medicine, 1990.
11. Baker SP, O'Neill B, Haddon W. The Injury Severity Score: a method for describing patients with multiple injuries and evaluating emergency care. *J Trauma* 1974; **14:** 187-196.
12. Directorate of Traffic Safety. Minder voetgangers sterf. *Robot* 1993; **3:** 31.
13. Peden, M. Pedestrian trauma on the N2 freeway: Is the motorist really to blame? *Trauma Review* 1993; **1**(3): 3.
14. Directorate of Traffic Safety. Pedestrian safety — is there an answer? *Robot* 1992; **3:** 8-10.
15. Haddon W, Valien P, McCarroll JR, Umberger CJ. A controlled investigation of the characteristics of adult pedestrians fatally injured by motor vehicles in Manhattan. *J Chron Dis* 1961; **14:** 655-677.

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