Road traffic accidents before and after seatbelt legislation - study in a District General Hospital

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Summary

Injuries among samples of car accident cases attending the Accident & Emergency (A & E) department of a District General Hospital (DGH) in the year before and after the introduction of seat belt legislation were classified applying the Abbreviated Injury Scale using information recorded in the patient case notes. Those who died or did not attend an A & E department were not included in the sampling frame.

The number of those who escaped injury increased by 40% and those with mild and moderate injuries decreased by 35% after seatbelt legislation. There was a significant reduction in soft tissue injuries to the head. Only whiplash injuries to the neck showed a significant increase.

Introduction

The seatbelt legislation was introduced on 31 January 1983 in the UK. Experiments in other countries had shown a reduction in morbidity and mortality of 25-65% among car accident cases following the introduction of seatbelt legislation[1-4]. In order to test the hypothesis that legislation would produce similar results in this country, the pattern of injuries among a sample of Road Traffic Accident cases attending the A & E department of the District General Hospital in Merton and Sutton for the year preceding the legislation was compared with that for the year succeeding legislation.

Methods

It was decided to study a 20% random sample of all patients who attended the A & E department of Merton and Sutton District General Hospital during the two years under study. This was done by obtaining the names of all patients who attended the A & E department during the period from February 1982 to January 1983 and February 1983 to January 1984 from the weekly returns of Road Traffic Accidents. All cases in this list were numbered and then a 20% random sample of names were obtained from the list. This gave a sample size of 95 car accident cases during the first and 85 during the second year of study. It was estimated that we would require 77 cases in each group to have a 90% chance of finding a significant difference at the 5% level.

For each patient the following information was obtained from the case notes:

(1) Administrative details: Name, age, sex, date and time of attendance, area of residence, whether car user or not.

(2) Information about the incident; whether victim was a driver, front seat, rear seat or 'position not known' user, whether admitted to hospital, duration of admission, number of operations and the number of outpatient visits.

(3) Injury details: Body region injured, number of injuries, ICD codes if available, severity of injuries coded using the Abbreviated Injury Scale, calculated value for Injury Severity Score (ISS) and Maximum Abbreviated Injury Scale (MAIS) and the outcome as recorded in the case notes.

The intention of the study was to classify injuries recorded in the case notes of patients attending an A & E department by using the Abbreviated Injury Scale (AIS)[5] and to classify the injuries of fatal cases by using the AIS on postmortem reports from the local Coroner's office. However, attempts to obtain postmortem reports failed.

The AIS used in this study classifies injuries into 6 scales; 1=mild; 2=moderate; 3=serious; 4=severe; 5=critical; 6=maximum injury. Each injury was assigned an AIS code number on a scale of 1-6 without regard as to whether or not the victim died.

The data was analysed using the SPSS^x package. Chi-squared and chi-squared with Yates' correction were calculated for age, sex, month of attendance, position in the car, injury to the region of the body, number of injuries, ISS and MAIS.

Results

The results of the analysis are shown in Tables 1-6. The difference in the distribution of summer and winter accidents for the two periods under investigation was statistically significant ($P<0.05$) (Table 2). Summer and winter months were determined by using the date on which summer and winter time adjustments were made in Britian. Attendance in winter decreased significantly in the post-legislation period. Soft tissue injuries to the head decreased in the post-legislation period and this decrease was statistically significant ($P<0.05$) (Table 4).

Table 1. Age and sex of car accident cases: 1982/3 and 1983/84

	1982/83		*1983/84*				
	n	*(%)*	n	*(%)*	χ^2 *value*	*d.f.*	*P*
Age (years)							
<24	32	(33.7)	34	(40)	0.77	1	0.380
>24	63	(66.3)	51	(60)			
Total	95	(100)	85	(100)			
Sex	Period 1		Period 2				
Male	54	(56.8)	40	(47.1)			
					1.79	1	0.180
Female	41	(43.2)	45	(52.9)			
Total	95	(100)	85	(100)			

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Table 2. Season of A & E attendances 1982/83 and 1983/84

	1982/83		1983/84				
	n	(%)	n	(%)	χ^2 value	d.f.	P
Summer	34	(35.8)	43	(50.6)	4.014	1	0.045
Winter	61	(64.2)	42	(49.4)			
Total	95	(100)	85	(100)			

Table 3. Seating position in car, car accident cases 1982/83 and 1983/84

Position in the car	1982/83		1983/84				
	n	(%)	n	(%)	χ^2 value	d.f.	P
Driver	51	(53.7)	45	(52.9)			
Front passenger	18	(18.9)	21	(24.7)	4.282	3	0.232
Rear passenger	22	(23.2)	19	(22.4)			
Not known	4	(4.2)	0	(0)			
Total	95	(100)	85	(100)			

Table 4. Injuries to region of body: car accident cases for the periods 1982/83 and 1983/84

Injury to region of the body	1982/83		1983/84				
	n	(%)	n	(%)	χ^2 value	d.f.	P
Head soft tissue	34	(35.8)	19	(22.4)	3.899	1	0.048
Head bone	4	(4.2)	3	(3.5)		NA	
Neck	4	(4.2)	0	(0)		NA	
Upper limb	18	(18.9)	8	(9.4)	3.301	1	0.069
Thorax	4	(4.2)	8	(9.4)	1.950	1	0.163
Abdo-pelvic	3	(3.2)	2	(2.4)		NA	
Lower limb	30	(31.6)	19	(22.4)	2.543	1	0.280
Total	95	(100)	85	(100)			

NA, not applicable

The difference in the number of injuries during the two periods was statistically significant ($P<0.05$) (Table 5). Fifty-two per cent had no injuries in the post-legislation period compared to 30% with no injuries in the pre-legislation period. The increase in the number of whiplash injuries to the neck in the post-legislation period (four before legislation and 13 after legislation) was statistically significant ($P<0.02$). The difference in the distribution of accident cases into three groups, ie no injury, mild injury and moderate injury during the two periods was statistically significant ($P<0.05$, Table 6).

Discussion

The results showed that the number of car accident cases decreased by about 10% in the post-legislation period. This decrease was not far from the 13%[6] decrease reported nationally among car users. When injuries to specific regions were analysed, injuries to all regions except 'thorax' and neck registered a drop in the post-legislation period; but only soft tissue injuries to the head showed a statistically significant

Table 5. Number of injuries among car accident cases for the periods 1982/83 and 1983/84

Number of injuries	1982/83		1983/84				
	n	(%)	n	(%)	χ^2 value	d.f.	P
No injuries	29	(30.5)	44	(51.8)			
1 injury	34	(35.8)	21	(24.7)	8.88	3	0.03
2 injuries	21	(22.1)	15	(17.6)			
3 or more injuries	11	(11.6)	5	(5.9)			
Total	95	(100)	85	(100)			

Table 6. Injury Severity Score and Maximum Abbreviated Injury Scale among car accident cases for the periods 1982/83 and 1983/84

	1982/83		1983/84				
	n	(%)	n	(%)	χ^2 value	d.f.	P
Injury severity score (ISS)							
No injury (0)	31	(32.6)	44	(51.8)			
Mild (1,2,3)	53	(55.8)	35	(41.2)	6.87	2	0.032
Moderate (4 & above)	11	(11.6)	6	(7.0)			
Total	95	(100)	85	(100)			
Maximum Abbreviated Injury Scale (MAIS)							
No injury (0)	31	(32.6)	44	(51.8)			
Mild (1)	53	(55.8)	35	(41.2)	6.87	2	0.032
Moderate (2 & above)	11	(11.6)	6	(7.0)			
Total	95	(100)	85	(100)			

decrease in the post-legislation period. The increase in thoracic injuries was not statistically significant. However, there was a significant increase in the number of whiplash injuries to the neck during this period. These findings were very similar to the observations made by Rutherford[7] and Patel[8].

Baker *et al.* in 1974, used the AIS code to develop an Injury Severity Score (ISS) for assessing victims with multiple injuries and this is widely accepted by researchers. The ISS is calculated by dividing the body into six regions, ie head or neck, face, chest, abdominal or pelvic contents, extremities or pelvic girdle and 'external'. The ISS is a mathematically derived code number determined by adding the squares of the highest AIS codes in each of the three most severely injured body regions. Another easy-to-use system is to record the maximum AIS (MAIS) for each patient. The MAIS is the highest single AIS code in a victim with multiple injuries. For all the patients included in this study the ISS and MAIS were calculated using the injuries recorded in the A & E case notes. The distribution of the number of injuries to the body, ISS and MAIS decreased significantly in the post-legislation period.

As this sample included only very few people with severe injuries, it was only possible to compare injuries grouped into (a) no injury, (b) mild injury and (c) moderate injury. It is possible that those who had

severe injuries were either brought in dead, in which case they would not be registered by A & E or were referred to the Regional neurosurgery unit in Wandsworth District. Nevertheless, the finding that those who escaped injury increased by 40% and those with mild and moderate injuries decreased by 35% in the post-legislation period was similar to published figures from other studies[9-11]. It was not possible to estimate whether the fall in injuries registered was more than that expected as a result of a downward trend observed in the incidence of injuries in spite of increased traffic density in the years preceding the legislation. Although only one district general hospital was studied, the reduction in the number of injuries and severity of injuries observed justify the continued enforcement of seatbelt legislation.

Unfortunately, only people seeking medical care at the A & E department were included in the sampling frame and the size of the population at risk was not quantified. As the denominator was not known, rates could not be calculated for any of the variables studied; nevertheless, it was reasonable to assume that the district general hospital served a fairly stable catchment population and any change in the proportion of different variables studied could be investigated for statistical significance. This assumption is further supported by the finding that nearly 75% of all the patients in our two years' sample had their residence in the parent district (Merton and Sutton). Although collecting information from A & E case notes is time consuming, it was essential because nearly 80% of all road traffic accident cases coming to the hospital receive only outpatient treatment.

The number of back seat occupants in this study was not large enough for statistical analysis. A prospective study of a larger number of belted and unbelted back seat occupants is worth considering. A study is also needed to determine if whiplash injuries to the neck in seatbelt wearers with and without headrests differ.

Finally, for any legislation to be effective, police must continue to enforce the law strictly.

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