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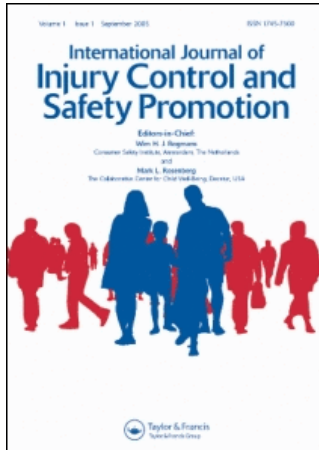
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The effect of seatbelt legislation on hospital admissions with road traffic injuries in an oil-rich, fast-developing country

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The objective of the study was to examine the effect of seat-belt legislation on hospital admissions with road traffic injuries and was designed as a retrospective descriptive study. All motor vehicle crashes recorded during the period 2001–2004 were extracted from the Emergency Medical Service Department. Details of the crashes, injuries and safety devices used were studied. The present study revealed that safety belt usage rates have increased from 8% in 2001 to 67% in 2004 among patients admitted to hospital with injury after road traffic crashes. The admission rate of patients with road traffic injuries per 100 000 population reduced by 17.7%. The enforcement of the seat-belt legislation played a vital role in reduction of hospital admissions due to road traffic crashes.

Keywords: Road traffic crashes; Injuries; Fatalities; Seat belt; Legislation; Qatar

1. Introduction

Traffic-related injuries are a major public health concern worldwide. However, unlike developed or high income countries, many developing countries have made very little progress towards addressing this problem. At the same time, many articles have been written during the last two decades drawing attention to the dangers of road traffic injuries in Arabian Gulf countries and road traffic crash is ranked the second highest cause of death after cardiovascular disease (Bener and Alwash 2002, Bener *et al.* 2003). The cost of fatalities and injuries due to road traffic crashes has a great impact on society (Bener 2002, Bener and Crundall 2005).

Seat belts are estimated to reduce motor vehicle fatalities by 50% and serious injury by 55% (Rivera *et al.* 2000). Many studies have shown that when a road crash occurs, the use of seat belts prevents certain types of injuries to vehicle occupants or in their severity (Freedman 1984, Dreghorn 1985, Evans 1990, 1991, Campbell 1991, Bener *et al.* 1992). It is documented that many years of mandatory seat-belt wearing for drivers and front seat passengers has saved lives and prevented serious injuries (Johnston and Armstrong 1986, Bener *et al.* 1994, Evans 1996, Narayan *et al.* 1997, Petridou *et al.* 1998, Koushki *et al.* 2003). In the UK, front seat belt usage rose from 37% to 95% after introduction of the seat belt law, which has also resulted in the reduction of

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hospital admissions due to road traffic injuries by 35% (Ashton *et al.* 1983, Rutherford 1985).

Road traffic crashes and injuries represent a significant health care problem in the State of Qatar and, currently, they are the third leading cause of death (Bener 2005). Fatal crashes mostly involve young people, especially young men. In 2002, 43% of the victims who died were unlicensed male drivers below 20 years of age (Bener 2005). Even though deaths of young female drivers are very low compared with their male counterparts, the overall loss of young people in road traffic crashes becomes a double loss to families and the nation (Bener 2005).

The seat belt legislation law was introduced on 1 January 2002, where the front seat passengers are required to wear a seat belt while driving, and anyone violating this rule will be fined QR100 (US\$27.4). The Traffic Safety Department made serious enforcement measures to bring the change into action and their efforts continued throughout the year. Drivers were stopped and fined on the spot if any of the front seat passengers was not wearing a seatbelt. So far the outcome of this intervention has not been studied. The aim of this study was to determine the effectiveness of the seat belt legislation on hospital admission rates due to road traffic crashes and seat belt adherence.

2. Subjects and methods

The current study was confined to the patients who were treated in the Accident and Emergency Department of Hamad General Hospital following road traffic injuries. The Hamad General Hospital acts as a primary hospital where all cases in the country are first reported. A total of 9653 patients were seen and treated in the Accident and

Emergency Department as a direct result of injury sustained in road traffic crashes during the study period (2001–2004). Of these, 6251 were car drivers and 3402 were passengers.

Details of these road traffic crash patients were compiled in the database of the Emergency Medical Services (EMS), which was collected regularly by the EMS staff using a standard questionnaire. The questionnaire included variables such as age, sex, the time of injury, the nature of injury, the region of the body injured and the severity of injury. Also recorded were whether the injured was the driver or the occupant of the vehicle, whether or not the occupant of the vehicle was wearing a seat belt at the time of the injury, whether one or two vehicles were involved in the collision and the final outcome.

The statistical analysis was performed using the Statistical Packages for Social Sciences (Norusis 1998). Chi-square analysis was performed to test for differences in proportions of categorical variables between two or more groups. The level $p < 0.05$ was considered as the cut-off value for significance.

3. Results

Table 1 shows the socio-demographic characteristics of the study population by seat belt use before and after seat belt legislation. The data show that there has been an increase in the number of seat belt users from 8% in 2001 to 67% in 2004, following the introduction of the seat belt law in comparison with 2001. It should be noted, however, that the true number of the general Qatari population who use seat belts is most probably higher. The current sample reflects people who were actually involved in a crash and is

Table 1. Percentage socio-demographic characteristics of the study population by seat belt use before 2001 and after the 2002 seat belt legislation.

Demographic Information	Year 2001 n = 2320		Year 2002 n = 2497		Year 2003 n = 2419		Year 2004 n = 2417	
	Seatbelt use		Seatbelt use		Seatbelt use		Seatbelt use	
	Yes = 186 (8%)	No = 2134 (92%)	Yes = 1024 (41%)	No = 1473 (59%)	Yes = 1282 (53%)	No = 1137 (47%)	Yes = 1610 (67%)	No = 807 (33%)
Age group (years)								
≤20	35 (7.4)	439 (92.6)	182 (36.8)	311 (63.2)	270 (51.3)	256 (48.7)	353 (62.9)	208 (37.1)
21–30	61 (7.1)	798 (92.9)	361 (39.8)	547 (60.2)	480 (54.5)	401 (45.5)	595 (68.0)	280 (32.0)
31–40	44 (8.8)	457 (91.2)	241 (43.7)	311 (56.3)	310 (54.4)	260 (45.6)	362 (69.6)	158 (30.4)
41–50	30 (10.0)	271 (90.0)	158 (45.2)	191 (54.8)	146 (50.6)	142 (49.4)	195 (66.3)	99 (33.7)
>50	16 (8.6)	169 (91.4)	82 (42.0)	113 (58.0)	76 (49.6)	78 (50.4)	105 (62.9)	62 (37.1)
Gender								
Male	161 (8.1)	1837 (91.9)	907 (41.6)	1272 (58.4)	1139 (53.6)	984 (46.4)	1411 (67.1)	693 (32.9)
Female	25 (7.8)	297 (92.2)	117 (36.9)	201 (63.1)	143 (48.4)	153 (51.6)	199 (63.6)	114 (36.4)
Nationality								
Qatari	59 (8.1)	666 (91.9)	313 (39.9)	470 (60.1)	439 (56.5)	339 (43.5)	539 (62.7)	320 (37.3)
Non Qatari	127 (8.0)	1468 (92.0)	711 (41.5)	1003 (58.5)	843 (51.4)	798 (48.6)	1071 (68.7)	487 (31.3)

therefore likely to under-represent cautious or safe drivers who are more likely to adhere to driving laws designed to increase safety.

Table 2 illustrates the mechanism of injury and patient's role according to seat belt use. Seat belt adherence has increased almost two-fold in the year 2004 after the implementation of the seat belt legislation in the year 2002.

Table 3 gives the percentage distribution of the studied population by type of injury before and after the implementation of the seat belt legislation. The unbelted vehicle occupants suffered the most injuries compared to all the other victims of road crashes in 2001 before the seat belt law.

Figure 1 shows the admission per 100 000 population of cases as a result of road traffic crashes. As can be seen, the rate has fallen from 389.7 per 100 000 to 334.1 per 100 000 in 2003 and 320.1 per 100 000 in 2004. The mortality rate due to road traffic crashes did not change significantly after the legislation was enforced in 2002 but remained constant until 2004.

4. Discussion

The present study revealed that safety belt usage rates have increased from 11% in 2001 to 67% in 2004, as measured

Table 2. Mechanism of injury and patient's role at the time of crash by seat belt use before and after the seat belt legislation.

Variable	Year 2001 n = 2320		Year 2002 n = 2497		Year 2003 n = 2419		Year 2004 n = 2417	
	Seatbelt use		Seatbelt use		Seatbelt use		Seatbelt use	
	Yes = 186 (8%)	No = 2134 (92%)	Yes = 1024 (41%)	No = 1473 (59%)	Yes = 1282 (53%)	No = 1137 (47%)	Yes = 1610 (67%)	No = 807 (33%)
Mechanism of injury								
Rollover	42 (5.7)	698 (94.3)	287 (39.8)	433 (60.2)	430 (60.5)	279 (39.5)	414 (65.1)	222 (34.9)
Collision	144 (9.1)	1436 (90.9)	737 (41.4)	1040 (58.6)	852 (49.8)	858 (50.2)	1196 (67.2)	585 (32.8)
Patient's role								
Driver	151 (8.5)	1618 (91.5)	531 (40.3)	788 (59.7)	1020 (60.4)	669 (39.6)	1016 (66.7)	508 (33.3)
Passenger	35 (6.3)	516 (93.7)	493 (41.9)	685 (58.1)	262 (35.9)	468 (64.1)	594 (66.5)	299 (33.5)

Table 3. Distribution of studied population by type of injury before and after the implementation of the seat belt legislation.

Location of injury*	Year 2001 n = 2320		Year 2002 n = 2497		Year 2003 n = 2419		Year 2004 n = 2417	
	Seatbelt use		Seatbelt use		Seatbelt use		Seatbelt use	
	Yes = 186 (8%)	No = 2134 (92%)	Yes = 1024 (41%)	No = 1473 (59%)	Yes = 1282 (53%)	No = 1137 (47%)	Yes = 1610 (67%)	No = 807 (33%)
Head	26 (14.0)	540 (25.3)	376 (36.7)	219 (14.9)	491 (38.3)	337 (29.6)	486 (30.2)	258 (32.0)
Face	9 (4.8)	290 (13.6)	177 (17.3)	112 (7.6)	261 (20.4)	168 (14.8)	263 (16.3)	123 (15.9)
Chest	14 (7.5)	218 (10.2)	189 (18.5)	85 (5.8)	245 (19.1)	125 (11.0)	261 (16.2)	107 (13.3)
Back	9 (4.8)	249 (11.7)	161 (15.7)	86 (5.8)	207 (16.1)	131 (11.5)	226 (14.0)	115 (14.3)
Neck	9 (4.8)	164 (7.7)	148 (14.5)	70 (4.8)	171 (13.3)	100 (8.8)	212 (13.2)	96 (11.9)
Shoulder	5 (2.7)	163 (7.6)	109 (10.6)	49 (3.3)	184 (14.4)	104 (9.1)	187 (11.6)	88 (10.9)
Lower leg	2 (1.1)	131 (6.1)	112 (10.9)	77 (5.2)	181 (14.1)	117 (10.3)	211 (13.1)	107 (13.3)
Knee	7 (3.8)	157 (7.4)	110 (10.7)	69 (4.7)	149 (11.6)	86 (7.6)	188 (11.7)	86 (10.7)
Upper arm	5 (2.7)	124 (5.8)	78 (7.6)	63 (4.3)	126 (9.8)	75 (6.6)	117 (7.3)	52 (6.4)
Lower arm	6 (3.2)	88 (4.1)	84 (8.2)	51 (3.5)	130 (10.1)	71 (6.2)	125 (7.8)	51 (6.3)
Elbow	5 (2.7)	98 (4.6)	70 (6.8)	50 (3.4)	65 (5.1)	58 (5.1)	89 (5.5)	46 (5.7)
Wrist	3 (1.6)	90 (4.2)	64 (6.3)	41 (2.8)	102 (8.0)	55 (4.8)	129 (8.0)	58 (7.2)
Abdomen	2 (1.1)	81 (3.8)	67 (6.5)	29 (2.0)	75 (5.9)	47 (4.1)	81 (5.0)	24 (3.0)
Ankle/Foot	3 (1.6)	56 (2.6)	43 (4.2)	26 (1.8)	45 (3.5)	41 (3.6)	46 (2.9)	28 (3.5)
Pelvis	1 (0.5)	49 (2.3)	31 (3.0)	12 (0.8)	40 (3.1)	27 (2.3)	47 (2.9)	12 (1.5)
Femur	1 (0.5)	57 (2.7)	25 (2.4)	10 (0.6)	71 (5.5)	59 (5.2)	38 (2.4)	74 (9.2)

*Multiple injuries, numbers and percentages do not add to total.

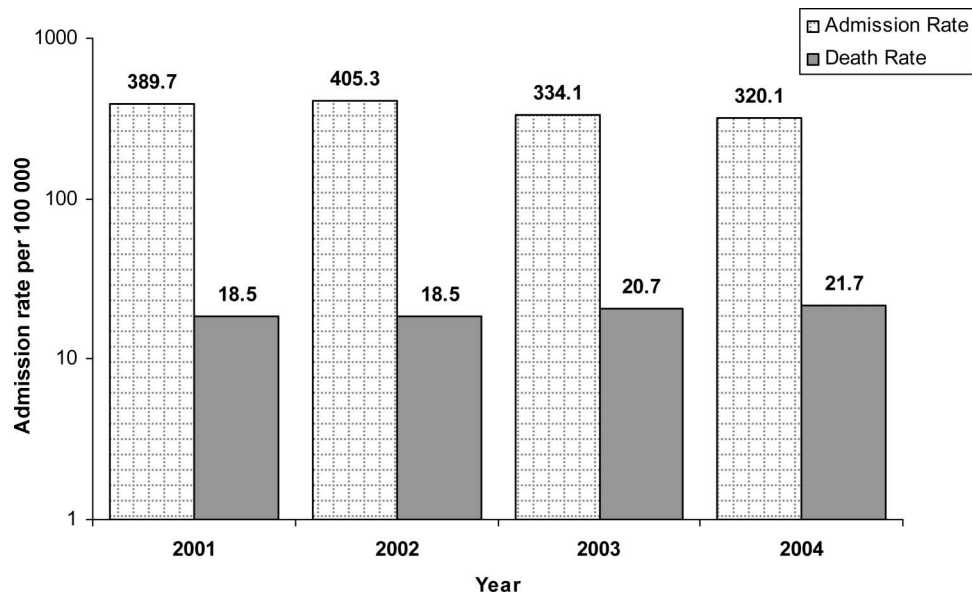


Figure 1. Admission rate per 100 000 population due to road traffic crashes during the years 2001–2004 in the State of Qatar.

by EMS in Qatar. This is consistent with the previous reported study in the United States (Derrig *et al.* 2002). This shows that mandatory seat belt law is effective in significantly increasing seat belt use.

Injuries due to road crashes are a problem that can be controlled considerably if adequate attention is given to accident and injury prevention strategies. Today, the most effective safety protection available for drivers and passengers is safety belts combined with air bags. In Qatar, it was found that the frequency of injuries of patients who were not wearing a seat belt before the introduction of the law was almost twice that of after. Since the enactment of the seat belt law in the year 2001, this is the first study to examine the impact of the law on the types of road traffic injuries in the State of Qatar.

A study conducted by the Albany Medical Center Hospital, New York (Mouzakes *et al.* 2001) identified that individuals using seat belts and airbags sustained facial injuries at a rate of 1 in 449 compared with a rate of 1 in 40 for individuals who did not use seat belts or airbags. A study in Singapore reported that seat belt regulation did not seem to impact on traffic fatalities (Jessie and Yuam 1998). The current study showed that the mortality rate remained constant; however, there was a considerable decrease in hospital admissions due to seat belt legislation.

Many investigators have published reports on the beneficial effects of wearing safety seat belts in road traffic crashes, but the growth in their widespread use has been very slow, especially in the Arabian Gulf and in developing countries (Bener and Jadaan 1990, Bener *et al.* 1992, Jessie and Yuam 1998, Klenk and Kovacks 2003, Koushki *et al.* 2003, Noland 2003).

Finally, it is important to educate the public that seat belts are effective in reducing fatalities and injuries and are also the greatest protection against passenger ejection.

The main contributors of causes of road traffic crashes, injuries and fatalities are carelessness in driver behaviour and excessive speed (Bener 2002, Bener and Alwash 2002). Therefore, it is important to change the behaviour of drivers through mass media, campaigns and health education. The findings of this study may effectively assist decision makers and international consultants in the formulation of policies and the development of alternative plans to enforce traffic safety interventions in the Arabian oil-rich Gulf countries.

5. Limitations

The limitation of this study was that due to incomplete records available from the EMS database it was not possible to retrieve data on the severity of the injuries. This could have enabled the study to compare the severity of injury with seatbelt users and non-users. Second, the position of the passenger (front/rear) was not well reported and, finally, EMS records did not document whether or not the driver was under the influence of alcohol or drugs.

6. Conclusion

Seatbelt adherence increased considerably after the implementation of the seat belt legislation and it has played a vital role in the reduction of admissions due to motor vehicle crashes.

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