Restraint use in the Eastern Province of the Kingdom of Saudi Arabia

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\section*{ABSTRACT}

\textbf{Objectives:} This study set out to examine seat belt and child restraint use in the Dammam Municipality of the Kingdom of Saudi Arabia, based on the premise that an increase in seat belt use would significantly reduce personal injury in traffic crashes. It was expected that local data would help identify intervention strategies necessary to improve seat belt use in the region.

\textbf{Methods:} The research involved 2 methodologies. First, 1,389 face-to-face interviews were conducted with male and female adults in regional shopping plazas regarding their own and their children's restraint use in their vehicles and reasons for these attitudes and beliefs. Second, 2 on-road observation studies of adult and child restraint use were conducted by trained observers. Occupants of approximately 5,000 passenger vehicles were observed while stopped at representative signalized traffic intersections.

\textbf{Results:} The findings showed front seat belt use rates of between 43 and 47% for drivers and 26 to 30% for front seat passengers; rear seat belt use rates were lower. While there seemed to be some knowledge about the purpose and reasons for restraining both adults and children in suitable restraints, this failed to be confirmed in the on-road observations.

\textbf{Conclusions:} Reasons for these rates and findings are discussed fully, and recommendations for improving seat belt use in the Dammam Municipality are included.

\section*{Introduction}

The Eastern Province of Saudi Arabia (Ash Sharqiyah) is the fifth largest province of the 13 that make up the Kingdom of Saudi Arabia. According to World Life Expectancy (2011), national road crash rates in the Kingdom of Saudi Arabia (KSA) currently exceed 23 deaths per 100,000 population, substantially greater than other highly motorized countries (Sweden, for example, has less than 4 per 100,000 currently). Police statistics reported by Traffic Safety Transport Network (TSTN) consultants showed that annual road crashes in the eastern province gave a high figure of 32 deaths per 100,000 people, which, when compared with the national figure, suggested that people living in the province are at greater risk of being killed on the province roads than those elsewhere in the Kingdom. Though these figures may seem exceptionally high, there are many other examples of similar rates in countries that have inadequate road safety programs (Organization for Economic Cooperation and Development/International Transport Forum 2014).

TSTN (2009) also calculated that the annual cost of road accidents in the Eastern Province of Saudi Arabia, using a human capital method, was 5.56 billion (Saudi Riyals) in 2008, including pain, grief, and suffering and other human costs. With a population of around 3.8 million inhabitants (Salam 2013) this translates to a cost of injury from road crashes of more than 1,500 Saudi Riyals per capita in this region. There were various reasons offered by these researchers to explain the higher crash rates in the KSA, including shortfalls in accident data systems, the need for improvements in vehicle safety engineering, driver training and testing, better traffic enforcement, safety publicity and education, improved emergency recovery, and treatment with a strong focus on evaluation and research. The issue of improved seat belt use by vehicle occupants was particularly highlighted.

Table 1 shows seat belt use rates in both front and rear seats for a number of countries. It shows that of the sample of 26 developed countries on 3 continents with legislative requirements for seat belt use, the top 7 (Australia, Canada, Germany, Malta, Norway, Sweden, and the UK) all reported higher seat belt use rates (above 90% in the front seating position): none of the others apart from Greece had use rates in the front seat below 59%.

As an example, seat belt laws were first introduced in Australia between 1970 and 1972. Oxley et al. (2009) reported that seat belt use rates in the front seat have been consistently around 95 to 98% across all occupants with lower usage among certain occupant groups (backseat passengers, some children, and in rural areas). Usage rates are around 70%, though, for those involved in fatal urban crashes, showing the advantages of reducing fatalities and serious injuries from using these devices.

Mandatory seat belt legislation was first introduced in Saudi Arabia for drivers and front seat passengers in 2000. Violation of this law, however, only invokes a relatively minor fine (150–300 SR) and no demerit points and the law is only randomly enforced if at all. There are few reliable figures available on adult seat belt use and on the use of child restraint systems (CRS) in passenger
vehicles in the KSA. A report by Bendak (2007), for example, found driver use rates of 28 and 15% for front seat passengers with high variability across the 3 regions studied in 2005. An increase in the rate of seat belt use has been shown to lead to substantial reductions in death and serious injuries in traffic crashes. The NHTSA (2009) for instance, reported that increased seat belt use in 38 states led to a substantial 1,652 additional lives being saved and fewer injuries and cost savings.

**Study objective**

This study set out to identify (1) what the level of seat belt use is on roads in the region and (2) what the residents of Dammam, the capital of the eastern province and the fifth largest city in Saudi Arabia, understand about the importance of the use of seat belts in cars. It was based on the premise that an increase in seat belt use would significantly reduce personal injury in traffic crashes and that local data would help identify intervention strategies necessary to improve seat belt use in the KSA.

**Methodology**

The research included 2 widely used methodologies; first, an on-road observation study of actual behavior and, second, a community survey of peoples’ attitudes toward seat belt use. Traffic police kindly agreed to avoid the sites during the observation and community surveys to avoid influencing the results and mall management agents consented to the surveys being conducted in their malls.

**Observation method—overt and covert**

The first procedure involved observing on-road seat belt use in the region. Two methods were employed for the on-road study, using overt (easily seen, obvious, and not hidden) and covert (in a way not easily seen or noticed).

The overt approach involved observers working in pairs who approached vehicles stopped at traffic signals, and while the first observer talked briefly with the driver about an unrelated issue, the second recorded restraint usage by both front and rear seat occupants. Overall, 3,675 vehicles were observed using the overt method. Cycle times at these intersections were 120 s or more to facilitate interviewers’ safety as used previously (Smith and Drummond 1988; Stevenson et al. 2007).

Site selection involved choosing a range of suitable sites that included both divided and undivided roads of varying traffic volumes across the 3 municipalities of Dammam, Dhahrans, and Khobar (Figure 1). Following the Smith and Drummond (1988) approach, the study team conducted random on-road observations of actual in-car seat belt use practices for 1 h maximum at both peak and normal traffic times, during weekdays and Saturdays. Time slots varied from 8 a.m. to 10 p.m., 10 p.m. to midnight, 2 p.m. to 4 p.m., and during twilight periods. Red light signal intersections were selected within the 3 municipalities that had sufficient cycle times to conduct an interview with the driver safely and the observers moved from site to site between observations. Eight locations from the 3 administrative municipalities were selected, namely, Al Shatea Mall, Dammam; Aajad International School, Dammam; IKEA, Dhahrans; Toyota Lexus, Dhahrans; Siver Tower, Khobar; Le Meridian Hotel, Khobar; and Gulf Centre, Khobar. Overall, there were 193 h of observations under taken randomly across the 8 sites.

Rejection rates were minimal (<10%) but there was some evidence of front seat occupants buckling up at the signals in the presence of the observers. Hence, a second (covert) method was also employed where observers acted as pedestrians crossing the road. They “casually” observed the restraint use behavior of just the front seat occupants in the adjacent lanes and recorded these findings after crossing the road. This was employed partly as a validation of the first method but also to provide additional adult data. More than 1,400 responses were obtained using the covert approach, again using the same sites as those used in the overt approach for consistency. For the covert trial, there were 62 h of observations across the sites.
Community survey

The second study involved face-to-face interviews with 1,389 male and female consenting adults who were approached and asked to participate in a university-based study examining seat belt knowledge and behavior. It was conducted in 5 regional shopping malls spread across the Dammam Municipality. The interview format was structured around a number of pre-determined research questions concerning the respondents’ own seat belt use behavior and, where relevant, their children’s restraint use while traveling in their passenger vehicles. The study adopted a similar format (similar questionnaire, conducted in malls) to that used in Australian research by Fildes et al. (1994).

The survey questionnaire was designed to address the study objectives and research questions. It had 3 main sections, namely, personal characteristics, seat belt use among adults, and restraint use among young (≤5 years and >5 years) children. The emphasis was on closed-ended (fixed choice) questions to keep the data collection analysis simple. However, there were also a few open-ended follow-up questions or comments to gain additional information on the respondents’ opinions or attitudes toward restraint use by adults and their children. The questionnaire was further translated for administration to Arabic respondents.

A number of university-trained interviewers were recruited who approached likely participants in a professional manner in 5 malls in the Dammam Municipality, seeking their participation (Figure 2). They were trained in how to approach likely participants in such a way as to avoid causing offense and they worked their way randomly around the malls across various levels and regions within these malls. The interviews took around 10 min to complete and the completion rate for the interviews was greater than 90%. The malls were selected to cover high and low economic areas across the 3 municipalities.

Results

On-road observations

Adult seat belt use rates

Overall, seat belt use rates from the 3,675 overt observations of adults in mainly urban areas of Dammam were 47% for drivers and 26% for front passengers, as listed in Appendix 1 (see online supplement) and shown in Figure 3. As noted earlier, rejection rates were minimal. Seat belt use rates among adults in the rear seat observations were considerably less than in the front seats.
Table 2. Number and wearing rate of covert observations for adults in front seat.

| Seating position | Total observations | Total restrained | Percent restrained |
|------------------|--------------------|------------------|-------------------|
| Drivers          | 1,442              | 625              | 43.30             |
| FRONT PASSENGERS | 632                | 194              | 30.70             |

and from 3 to 9% in the first rear row depending on seating position. Because there were very few adults seated in the second rear row (SUV vehicles mainly), these figures are not considered reliable.

Comparable front seat results from the 1,442 covert recordings from similar locations are shown in Table 2, where only 43.3% of the 1,442 drivers observed and 30.7% of the 632 front passengers were restrained. Overall, there was no statistical difference between the front seat findings across the overt and covert methods ($\chi^2 = 1.25, df = 1, P = .26$).

Child seat belt use rates

Given that there was little difference between the results from the 2 observation methods, child restraint observations were only collected for the overt approach. These results are listed in Appendix 1 and shown in Figures 4 and 5 for children aged 5 years or less and those aged 6–10 years.

The age group of the child was judged by the interviewer who had undergone some initial training in this. For children aged up to and including 5 years, 11 were seated on the driver’s lap in the front seat and were unrestrained. Of the 160 seated in the front passenger’s seat, only 8% were restrained. Many of these were also observed to be seated on the front seat passenger’s lap. In the first row rear seat, restraint rates varied from 18 to 27%. Unfortunately, how many were also seated on the lap of an adult was not recorded. Again, the numbers seated in the second row rear were very small and with low restraint use and are not likely to be reliable.

Older children’s use rates were generally less than those of younger children in the rear seats but slightly higher in the front (a number of them were seated independent of an adult). Again, 2 children over 5 years were seated on the driver’s lap, with 1 of them restrained by the driver’s seat belt. First row restraint users varied from 5 to 12% and second row usage seemed to be higher among the older children but, again, the numbers are too low to be reliable.

Child restrain usage

Adult seat belts are not suitable restraints for children, especially those aged less than 5 years. For adequate protection in a moving passenger vehicle, a child must be seated in an approved child seat for the child’s age and size to prevent trauma from the belt itself. Figure 6 shows the observed restraint use for each of the 679 children in the study. The vast majority were unrestrained and the use of a CRS varied from 3% in the front, to 14% in the second row, to 0% in the second rear row. These figures show that overall, children in vehicles in the KSA are grossly under-protected in passenger vehicles and face greater risk of serious injury or death in a collision. The current policy on restraint use in the KSA does not include any requirements about appropriate child restraint use.

Community survey results

A complementary community survey was specifically designed for this study and conducted to supplement these on-road observations; the respondents’ characteristics are outlined in Table 3.

The sample was predominantly male, two thirds were Saudi nationals, a high proportion lived within the Dammam Municipality, and slightly more than half were married. Only males are allowed to drive a vehicle in the KSA. By age group, 16% were less than 20 years, 44% were age 20 to 30 years, 33% were age 31 to 50 years, and the remaining 7% were age 51 years and above. Overall, females were slightly younger on average than males. Eighty-nine percent had completed high school and 50% had a university degree or graduate qualifications.
Adult seat belt use responses

Respondents were asked whether they always wore their seat belt, wore it some of the time, or hardly ever wore it. Only 34% of the respondents claimed to always wear their seat belt when traveling in cars. Furthermore, the proportion of those who always wore their seat belt was lower among Dammam Municipality respondents but higher for older males (66 years and above) and those with higher levels of education.

Chi-squared tests were performed with acceptable significant levels of $P = 0.01$ or lower, given the multiple number of tests performed. There were no significant differences in the responses for where they lived ($P = .56$). Reasons given for not always use a seat belt included only at police check points or during long-distance travel and a few mentioned that it was not common in the Arab culture.

Other findings

Those who were licensed to drive (males) were more likely to report always using their seat belt than those who were not licensed (predominantly female passengers; $P = .000$). In addition, married respondents (males and females) were more likely to report always using a seat belt than single respondents ($P = 0.00$). There was a high proportion (87%) of all respondents, young and old, married and single, who knew that legally they were required to wear their seat belt when traveling in the KSA ($P = .000$). This was more common among males and those licensed, which suggests that they are probably covariates.

Sixty-six percent of Saudi motorists surveyed responded that seat belts definitely saved lives, although this was less for Saudi nationals ($P = .000$), singles ($P = .000$), and younger motorists ($P = .000$). These findings were not significant by education level ($P = .026$), licensing ($P = .15$), or the region in which they lived in ($P = .56$). Only half of those who reported always using a seat belt agreed that seat belts saved lives, suggesting that they were motivated to wear their seat belt by other than safety reasons (being fined by the police, for instance).

One third of the respondents claimed that it was important to wear a seat belt in the rear seat, and older ($P = .000$), licensed ($P = .009$), and married ($P = .000$) respondents were more likely to believe so. Stated reasons for not believing included that injuries are more likely to occur in the front seat; it is not a legal requirement in Saudi Arabia; women and children tend to sit in the rear (safer); belts are uncomfortable; and belts are inappropriate for large-sized people. Those who worked for particular companies noted that it was a company requirement for them to wear seat belts wherever they sat in the vehicle and they generally complied with this policy. The need for education to inform people of the benefits of seat belt use in the rear was also raised as an issue in the survey.

Child seat belt use responses

Overall, 88% of the respondents agreed that young children should be restrained in a suitable CRS in a moving vehicle, and this increased with increasing education levels ($P \leq .001$) and among licensed drivers ($P = .01$). The most popular response was for safety, comfort, and to constrain children within a moving vehicle. Those who believed that they did not need restraining felt that the adult seat belt was (correctly) not suited to children, they were adequately restrained by their parents, and they were well protected spiritually.

One half of the respondents thought (correctly) that it was not an offense if children were unrestrained, especially among KSA respondents. Roughly half of the respondents who have or had children claimed to always have them restrained in a suitable CRS. Interestingly, the same proportion claimed that they have not always used CRS. Older respondents, 50 years or older ($P = .000$), and those with higher education levels ($P = .000$) in particular were much more likely to claim that they used CRS. Those who have currently have children were more likely to use CRS as well, which might reflect on the past availability of these devices ($P = .000$).

Finally, 44% of the respondents thought that an adult seat belt was a sufficient restraint in a moving vehicle for children under 10 years. Licensed drivers (males) were more likely to agree that an adult belt is sufficient than unlicensed respondents ($P = .008$). Those who thought that an adult seat belt was not sufficient called for more training programs and publicity campaigns on the unsuitability of adult seat belts for children, legislation, and need for wider use of CRS in the KSA.

General discussion

This project set out with 2 objectives: first, to determine what the level of seat belt use is on roads in the Dammam region and, secondly, to identify what the residents of Dammam understand about the importance of seat belt use in cars for adults and children.

On-road seat belt use

Observed seat belt use rates were between 43 and 47% for drivers and 26 and 30% for front seat passengers. Previous reports on seat belt use in Saudi Arabia have noted lower use rates. As noted earlier, Bendak (2007) found driver use rates of 28 and 15% for front seat passengers with high variability across the 3 regions studied. In 2010, TSTN reported that 18% of drivers and 13% of front passengers wore seat belts in urban areas, with higher rates in rural zones. Naeem (2010) identified use rates of 33% for drivers and 4% for passengers in his report on seat belt use rates conducted between 2008 and 2009. The better driver rates observed in this study may be attributed to an increase in enforcement during 2014. In an unpublished study by Hoque
et al. (2014), use rates observed at a number of police check stops in the Dammam Municipality were higher than 90% (with similar increases in front seat passenger rates). This clearly indicates the influence that police enforcement can have in this area.

Rear seat use rates were much lower, with only 3 to 9% observed to be properly restrained with a seat belt. This is most likely explained simply by the lack of legislation in the KSA requiring the use of restraints in the rear and the (false) assumption by motorists that they are safer in the rear seat. This interpretation can lead to rear seat passengers being at greater risk of ejection, the higher likelihood of more serious injuries from contact within the inside of the vehicle in a crash, and an added danger to front seat occupants from contact with rear seat passengers being thrown into the front compartment in a frontal crash.

International reports show that seat belt use rates in developed countries are all well above the rates reported in Saudi Arabia. As shown earlier, Australia, Canada, France, Germany, Malta, Norway, Sweden, and the UK all reported use rates in the front seat of 90% or higher. All of these countries have seat belt legislation for either front seat occupants or all occupants (World Health Organization 2013) and that this legislation is typically well supported with police enforcement programs (Zaal 1994). Mackay (1985), Hedlund (1985), Evans (1991), and the NHTSA (2009) all reported significant benefits to car occupants in a crash from seat belt use. The Office of Road Safety in Western Australia (2014) noted that a fatality is 10 times more likely in a road crash if a seat belt is not used.

The most common reasons expressed in the community survey by those who hardly ever wore their seat was related to their attitude such as “I don’t want to,” “I’m lazy,” “I don’t need it,” “It’s uncomfortable,” “It’s not the Arab culture,” and “I forget to put it on.” Interestingly, though, many of these declared nonusers did admit to using their belts at police checkpoints — clearly, enforcement was a high motivator for them putting their seat belt on. In a similar survey conducted in Greece by Chliaoutakis et al. (2000), they revealed that positive factors related with seat belt use among young drivers included “imitation,” “self-protection,” and “legality,” whereas “discomfort” and “mileage driven” were negatively associated.

**Children at risk**

By far the most alarming results found in this study were the restraint use rates for children in the cars observed in this study. A study by Thomsen (cited by McGinley 2010) also reported almost no child restraint use in the United Arab Emirates, with infant and toddler use rates of 23%, despite the high acceptance of the benefits of seat belt use highlighted many problems and challenges in the region. Though there were signs of a recent increase in use rates in Saudi Arabia, the level of seat belt use in the Dammam Municipality was well below international best practice. Use rates for adults and children were very poor in the rear seats. Adult responses in the community survey confirmed the observed figures, suggesting that their responses were honest but also that they were misinformed of the risks and benefits. Though vehicle occupants in KSA are legally obligated to wear their seat belts in all seating positions, this was relatively unknown among the respondents and appears to be rarely enforced. There are substantial benefits to be gained by KSA residents including fewer deaths and serious injuries if seat belt use rates can be increased to international levels.

**This study of observed seat belt behavior and adults’ appreciation of the benefits of seat belts highlighted many problems and challenges in the region. Though there were signs of a recent increase in use rates in Saudi Arabia, the level of seat belt use in the Dammam Municipality was well below international best practice. Use rates for adults and children were very poor in the rear seats. Adult responses in the community survey confirmed the observed figures, suggesting that their responses were honest but also that they were misinformed of the risks and benefits. Though vehicle occupants in KSA are legally obligated to wear their seat belts in all seating positions, this was relatively unknown among the respondents and appears to be rarely enforced. There are substantial benefits to be gained by KSA residents including fewer deaths and serious injuries if seat belt use rates can be increased to international levels.**

Of particular concern were the poor use rates among children, especially those less than 5 years of age. Child rates were poor (less than 10% generally) in both front and rear seats, and those restrained were equally likely to be using an adult seat belt
or in a suitable child restraint. Adults’ knowledge of the need to have a young child in a suitably designed CRS was high yet not reflected in the observed use rates on the road. The dangerous practice of having unrestrained children in the front seat, in the driver's lap, and/or held by the child's parent must be eliminated to maximize child passenger safety and maintain the adults’ duty of care to their children. Age, gender, and education were found to be associated with higher safety appreciation and seat belt use compliance, and in some instances, Dammam Municipality residents and those living in the region held fewer safety attitudes than others from the Gulf Cooperation Council or international respondents. Clearly, there is a need to extend the current legislative requirements in the KSA to mandate rear seat belt use, as well as the use of CRS for children, combined with greater enforcement of seat belt use. There is an urgent need to promote and educate all vehicle occupants about the importance and need for the widespread use of vehicle restraints that would inevitably lead to fewer deaths and serious injuries in the region.

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