

Rear Seat Belt Use in Developing Countries: A Case Study from the United Arab Emirates

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Abstract—The seat belt is a vital tool in improving traffic safety conditions and minimising injuries due to traffic accidents. Most developing countries are facing a big problems associated with the human and financial losses due to traffic accidents. One way to minimise these losses is the use of seat belts by passengers both in the front and rear seats of a vehicle; however, at the same time, close to nothing is known about the rates of seat belt utilisation among rear seat passengers in many developing countries. Therefore, there is a need to estimate these rates in order to know the extent of this problem and how people interact with traffic safety measures like seat belts and find demographic characteristics that contribute to wearing or non-wearing of seat belts with the aim of finding solutions to improve wearing rates. In this paper, an observational study was done to gather data on restraints use in motor vehicle rear seats in eight observational stations in a rapidly developing country, the United Arab Emirates (UAE), and estimate a use rate for the whole country. Also, a questionnaire was used in order to study demographic characteristics affecting the wearing of seatbelts in rear seats. Results of the observational study showed that the overall wearing/usage rate was 12.3%, which is considered very low when compared to other countries. Survey results show that single, male, less educated passengers from Arab and South Asian backgrounds use seat belts reportedly less than others. Finally, solutions are put forward to improve this wearing rate based on the results of this study.

Keywords—Seat belts, traffic crashes, United Arab Emirates, rear seats.

I. INTRODUCTION

MOTOR vehicles form a vital method of transporting human beings. They also have the potential of endangering human lives in road traffic accidents. Traffic accidents claimed the lives of 1.25 million people in 2013 and were the leading cause of death among those aged 15-29 years and the ninth leading cause across all age groups globally [1]. Although total prevention of traffic collisions is not possible, minimising harmful effects of those collisions on motor vehicle users is possible using protective devices like seat belts. The use of seat belts has been proven to be one of the most effective ways to reduce or limit the negative impact of accidents on passengers travelling inside the motor vehicles involved [2]-[5]. This is due to the fact that seat belts distribute the forces of rapid deceleration due to any sudden change in direction, stop or crash, over larger and stronger

parts of the human body, such as the chest, hips and shoulders [6].

The UAE is a rapidly developing Middle Eastern country that consists of seven emirates, namely Abu Dhabi, Dubai, Sharjah, Ajman, Umm Al Qiwain, Ras Al Khaimah, and Fujairah. It has a land area of 83,600 km² and an approximate population of 9.5 million, of whom 11.5% are nationals and 88.5% are expatriates (NBS-UAE, 2014). Urban development in UAE and the rise in GNP and living standards, which accompanied the oil boom, brought dramatic improvements to the road network and a sharp increase in the number of motor vehicles in the country. This, in turn, resulted in a serious road accident problem like many other countries throughout the Middle East [1], [7], [8]. It is estimated that financial loss due to road traffic crashes constitutes 1.3% of GDP in UAE and that the road traffic fatalities rate per 100,000 of population is 10.9, which is considered high when compared to developed countries. Therefore, every effort should be done to try to minimise these accidents [1], [9].

In order for any road safety program to succeed, there is a great need for detailed official statistics supported by extensive research on how successful road safety measures are and how road users perceive and interact with these measures. Authorities in UAE introduced a law in 1999 that made the use of seat belt compulsory for drivers and front seat passengers. However, and like many other developing countries, availability of detailed national statistics and reports on seat belt use and other road safety indicators in UAE is scarce. The same applies to published research findings. Only very few published research studies that tackled the issue of seat belt use directly or indirectly in moving motor vehicles in UAE could be found in the literature.

In the first study, El-Sadig et al. [10] assessed the effects of seat belt wearing on the number of injuries and fatalities due to traffic crashes in Al-Ain Hospital in UAE before and after enacting the seat belt law, as this hospital reportedly receives 70% of traffic crash casualties in that district of Abu Dhabi emirate. Results showed that there was a significant declining trend in injuries and fatalities due to enacting the law, the proportion of minor injuries significantly increased from 42% in the pre-implementation to 77% in the post-implementation period, and the median number of hospital bed days dropped from five to three days. The reported rate of seat belt compliance was 86% by drivers, 87% by front seat passengers and 11% by rear-seat passengers. Nevertheless, the authors admitted that these findings might have been too optimistic and that a more reliable estimate could have come from a roadside observational study.

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In another study, Abu Zidan et al. [11] studied the effects of seat belt usage on injury patterns and outcomes of 766 trauma patients due to road traffic crashes admitted to two main hospitals in the city of Al-Ain in UAE between April 2006 and October 2007. The authors found that seat belt usage significantly reduces the severity of injury, hospital stay, and number of operations on injured patients and that the overall reported seat belt use of all vehicle occupants was 17.6%.

In the latest and most comprehensive study by Bendak and Al-Saleh [9], the authors assessed the use of seat belts of drivers and front seat passengers as well as drivers' perceptions across all seven emirates of UAE through a roadside observational study and by randomly distributing a questionnaire. In the former, the authors found that on the average, 61% of drivers and 43.4% of front seat passengers use their seat belts in moving motor vehicles across the country and that there were significant differences between the seven emirates. Questionnaire results revealed that young male single drivers are less likely to wear their seat belts than other groups of drivers and that many drivers underestimate the importance of wearing seat belts for themselves and for their passengers.

In countries adjacent to UAE, there were also some attempts to study seat belt use. For example, Klair and Arfan [4] studied the use of seat belts across Pakistan and found that the average seat belt use rate was 20% with the highest rate recorded on motorways (53%) and the lowest on rural roads (5%). The authors added that lack of awareness of the law/usefulness, seat belt not fitted, discomfort, forgetfulness, low speed, and careless attitude were major reasons for noncompliance with seat belt laws among Pakistani drivers. The authors concluded that seat belt use rates were directly proportional to law enforcement strength and that there is an urgent need to revise existing seat belt laws in Pakistan in order to raise seat belt use rates.

In adjacent Saudi Arabia, which passed laws that made the use of seat belts compulsory in 2000 for drivers and front seat passengers, Bendak [3] estimated the seat belt wearing rate in the first few months after enacting the law to be 60% for drivers and 22.7% for front seat passengers in an observational study. However, Bendak [7] estimated that these rates dropped to 27.8% for drivers and 14.7% for front seat passengers five years after enacting the law, due mainly to weak enforcement of the law. The same author also studied drivers' perceptions of the issue and their wearing habits using a questionnaire. Results showed that less educated male single drivers are less likely to wear seat belts or to ask their passengers to wear them than other groups of drivers.

Fatality and injury rates due to traffic crashes are high in UAE when compared to other countries [1]. Since wearing seat belts for all passengers in moving motor vehicles is vital in dropping these rates, it is important to determine the use rate among rear seat passengers, to assess passengers' perceptions of this issue and to determine personal demographic characteristics affecting seat belt use. This study aims to do that in two phases, a roadside observational phase and a questionnaire phase. Results are anticipated to help road

traffic authorities, non-governmental organisations and researchers develop strategies to improve seat belt use awareness among motor vehicle rear seat passengers and increase belt utilisation in UAE.

II. METHODOLOGY

Methods reported in the literature that can be used to estimate and assess seat belt compliance rate and practices include checking police and hospital records, direct roadside observations and self-reporting questionnaire surveys [3], [10], [12]. In the current study, direct roadside observations of rear seat passengers and a self-reporting questionnaire survey are used. For this purpose, direct roadside observations were taken at two locations in each of Ajman, Dubai, Fujairah and Sharjah emirates. These four emirates represent more than 64% of the UAE population [13] and data collected in them was thought to be a good indicator of the situation in the whole country. Two locations, one at a petrol station entrance and another at a large shopping centre main entrance, were chosen in each of these four emirates. The location of the eight observation stations was determined relying on personal opinion to ensure high passing traffic volume and the safety of data collectors, and also relying on Google Earth. Those eight locations are given in Table I. Rear seat passengers at each observation station were observed for two hours during traffic peak times between 5 p.m. and 9 p.m. on Thursday, Friday and Saturdays evenings (representing weekend evenings in UAE). Based on previous studies like Bendak [7], and Eby and Vivoda [14], it was anticipated that the number of collected data points would be enough.

TABLE I
 LOCATION OF OBSERVATION STATIONS

| Emirate | Petrol Station Location | Shopping Centre |
|----------|-------------------------|--------------------|
| Ajman | Aljurf Rd | Sharjah City Cen. |
| Dubai | Alkhanawij Rd | Mirdif City Cen. |
| Fujairah | Hamdan Bin Abdulla Rd | Fujairah City Cen. |
| Sharjah | Althaid Rd | Mega Mall |

In the second phase of the study, a questionnaire was randomly distributed to a sample of potential motor vehicle passengers across the whole country in Arabic or English. Potential respondents were explained, on an individual basis, the purpose of the questionnaire and their consent was sought. If consent was granted, they were asked to answer the questions. The questionnaire was kept short (single-sided A4 sheet) to encourage participation by potential respondents. The sample size was determined using an online sample size calculator available on the Australian Bureau of Statistics website [15] with a 95% accuracy level and 95% confidence level. Also, the number of motor vehicles in the country is estimated to be 2.674 million [1]. The proportion of motor vehicles with rear seat passengers was estimated to be 20% of the whole motor vehicle population relying on estimates from the roadside observational study. The site gave a sample size of 246, but it was decided to keep collecting questionnaires till the end of October 2016 when the number reached 511

responses.

The questionnaire, a slightly altered version of a one developed by Bendak [7], asked first about five demographic characteristics of respondents (age, gender, nationality, education level and marital status). Then, respondents were asked to respond to four simple questions by choosing the response that matches their situation as follows:

1. When sitting on the back seat of any car, how often do you wear a seat belt? (All or most of the times, Sometimes, Rarely or never, Not applicable (I never sit in back seats)).
2. While driving, do you ask passengers on the back seat to wear their seat belts? (Yes, Sometimes, No, Not applicable (I don't drive or I usually don't have passengers with me on back seats)).
3. Do you believe that passengers in back seats should wear their seat belts while the vehicle is moving? (Yes, No, I don't know).
4. Do you support introducing a new law in UAE that makes wearing seat belts on back seats compulsory? (Yes, No, I don't have any opinion).

For roadside observational study, descriptive statistics and cross tabulation were used to describe the data. Also, unpaired t-test or analysis of variance were used to check if significant differences existed in restraint use due to the two location types (petrol station and shopping centre), different emirates (Ajman, Dubai, Fujairah and Sharjah) and different passenger groups (male, female and children).

For survey results, descriptive statistics and cross tabulation were used to evaluate effects of personal demographics on output variables (i.e. survey responses). Also, as normality of output variables in the questionnaire could not be assumed due to the limited number of response levels (which were between two and six), a non-parametric test, namely Kruskal-Wallis one-way analysis of variance, was done using SPSS version 22. Input (independent) variables were age, gender, marital status, education level and nationality. Output (dependent) variables were wearing seatbelt, asking passengers to wear seat belt, believe all passengers should wear seat belts and support for making seat belt wearing compulsory by law. Significance level adopted in this study is $\alpha = 0.05$.

TABLE II
FIELD STUDY RESULTS

| Emirate | Location | Vehicle no. | Passenger | No. | No. restr. (%) |
|-------------|----------|-------------|-------------|------|----------------|
| Ajman | PS | 213 | Male | 115 | 10 (8.7%) |
| | | | Female | 122 | 18 (14.8%) |
| | | | Children | 87 | 10 (11.5%) |
| | SC | 216 | Male | 151 | 13 (8.6%) |
| | | | Female | 187 | 16 (8.5%) |
| | | | Children | 152 | 15 (9.8%) |
| Total | 429 | 814 | 82 (10.1%) | | |
| Dubai | PS | 216 | Male | 156 | 10 (6.4%) |
| | | | Female | 202 | 20 (9.9%) |
| | | | Children | 120 | 22 (18.3%) |
| | SC | 298 | Male | 58 | 0 (0%) |
| | | | Female | 102 | 14 (13.7%) |
| | | | Children | 218 | 60 (27.5%) |
| Total | 515 | 856 | 126 (14.7%) | | |
| Fujairah | PS | 207 | Male | 214 | 34 (15.9%) |
| | | | Female | 126 | 16 (12.7%) |
| | | | Children | 63 | 9 (14.3%) |
| | SC | 238 | Male | 322 | 51 (15.8%) |
| | | | Female | 200 | 37 (18.5%) |
| | | | Children | 111 | 21 (18.9%) |
| Total | 445 | 1036 | 168 (16.2%) | | |
| Sharjah | PS | 216 | Male | 151 | 0 (0%) |
| | | | Female | 123 | 6 (4.8%) |
| | | | Children | 125 | 9 (7.2%) |
| | SC | 298 | Male | 89 | 4 (4.5%) |
| | | | Female | 208 | 40 (19.2%) |
| | | | Children | 167 | 17 (10.2%) |
| Total | 514 | 863 | 76 (8.8%) | | |
| Grand Total | | 1903 | | 3569 | 439 (12.3%) |

III. RESULTS

A. Field Study Results

As mentioned earlier, data was collected in eight

observation stations spread across four of the seven emirates that constitute the UAE. Approximately one in every six observed passing motor vehicles had passengers sitting on rear seats. Observational study results are summarised in Table II.

As can be seen in that table, a total of 1903 motor vehicles were observed in the study in which there were 3,569 passengers sitting on back seats. Out of those, 1,903 motor vehicles, 429, 515, 445 and 514 vehicles were observed in Ajman, Dubai, Fujairah and Sharjah, respectively, with the number of passengers on back seats observed being 814, 856, 1,036 and 863, respectively.

The overall observed restraint use rate on back seats was 12.3% with 10.1% recorded in Ajman, 14.7 % in Dubai, 16.2% in Fujairah and 8.8% in Sharjah. These differences between the four emirates were statistically significant ($p = 0.03$). Moreover, this rate was 9.7% for male passengers, 13.1%, for female passengers and 15.6% for children. These differences between the three groups of passengers were also statistically different ($p = 0.03$). There were no statistically significant differences between the two types of observation locations (petrol stations vs. shopping centres).

B. Survey Results

Out of the 511 people who responded to the questionnaire, 53.6% were males and 46.4% were females. The average age of respondents was 30.6 years (stdev 9, min 16, max 59).

Responses to other questions on demographic characteristics of participants are given in Table III.

As can be seen in the Table III, three quarters of respondents came from Arabic countries (either UAE nationals or citizens of other Arab countries) with the remaining quarter divided between South Asians, American/West European and others. Reported education level was spread across all groups, while reported marital status was almost equally divided between single and married.

Responses to the seatbelt related questions are summarised in Table IV. Statistically significant results from the analysis are given in Table V. In the same table, interpretation of those significant results is also given.

Overall, demographic characteristics affected the way participants responded to most of the questions. Older people, Europeans/North Americans, more educated people and married people reported a safer behaviour (wearing seatbelts, asking other passengers to wear seatbelts and believing in the importance of wearing seatbelts) and supported introducing a seatbelt enforcement law for back seats in UAE than other participants.

TABLE III
PERSONAL CHARACTERISTICS OF QUESTIONNAIRE RESPONDENTS

| | | | | |
|--------------------|------------------------|-----------------------|--------------------------------|--------------------------|
| Nationality | Arabs 386 (75.5%) | Sth Asians 78 (15.3%) | Nth American/ Europe 11 (2.1%) | Others 36 (7%) |
| Ed. Level | HS or lower 96 (18.8%) | Diploma 63 (12.3%) | BSc 268 (52.4%) | MSc or higher 84 (16.4%) |
| Marital S. | Single 250 (48.9%) | Married 245 (47.9%) | Other 16 (2.6%) | |

TABLE IV
QUESTIONNAIRE RESULTS

| | | | | |
|--|-------------------------------------|-----------------------|-----------------------------|---------------|
| Wearing seatbelts | All or most of the times 91 (17.8%) | Sometimes 69 (13.5%) | Rarely or never 335 (65.6%) | N/A 16 (3.1%) |
| Asking rear seat passengers to wear seatbelts | Yes 72 (14.1%) | Sometimes 131 (25.6%) | No 269 (52.6%) | N/A 39 (7.6%) |
| Believe passengers should wear seatbelts | Yes 341 (66.7%) | No 110 (21.5%) | I don't know 60 (11.7%) | |
| Supporting seatbelt law | Yes 319 (62.4%) | No 122 (23.9%) | I don't know 70 (13.7%) | |

TABLE V
SURVEY STATISTICAL ANALYSIS RESULTS WITH THEIR INTERPRETATIONS

| Independent Variable | Dependent Variable | P-value (F value) | Interpretation of Results |
|------------------------|--|-------------------|---|
| Age | Wearing seatbelt | 0.00 (2.28) | Reported seatbelt wearing rate increases with age |
| | Ask passengers to wear seatbelts | 0.04 (1.69) | Older drivers tend to ask rear seat passengers to wear seatbelts more often than younger ones |
| Nationality | Wearing seatbelt | 0.00 (5.7) | Europeans/North Americans reported wearing seatbelts more often than others |
| | Ask passengers to wear seatbelts | 0.03 (3.47) | Europeans/North Americans reported asking passengers to wear seatbelts more often than others |
| Education level | Wearing seatbelt | 0.00 (9.1) | Reported seatbelt wearing rate increases with higher education levels |
| | Ask rear seat passengers to wear seatbelts | 0.00 (5.59) | Reported rate of asking rear seat passengers to wear seatbelt increases with higher education levels |
| | Belief in the importance of rear seat passengers wearing their seatbelts | 0.03 (3.37) | Reported belief in the importance of rear seat passengers wearing seatbelts increases with higher education levels |
| Marital status | Wearing seatbelt | 0.00 (9.58) | Married people reported wearing seatbelts more often than single people |
| | Ask rear seat passengers to wear seatbelts | 0.00 (5.1) | Married people reported asking rear seat passengers to wear seatbelts more often than single people |
| | Belief in the importance of rear seat passengers wearing their seatbelts | 0.00 (5.02) | Married people reported greater belief in the importance of rear seat passengers wearing seatbelts than single people |
| | Support a law enforcing seatbelt wearing on rear seats | 0.01 (3.96) | Married people reported greater support to make wearing seatbelts mandatory on back seats than single people |

IV. DISCUSSION AND CONCLUSIONS

Despite increasing evidence showing that not using any restraint in moving motor vehicles is an unsafe practice, many

rear-seat passengers still engage in this behaviour. This is clear from observational study results which show that the estimated restraint use rate on back seats is 12.3%. Such a rate

is considered very low, especially when compared to driver and front seat passengers wearing rates in UAE, which are estimated to be 61% for drivers and 43.4% for front seat passengers [9]. One factor that can explain the difference in wearing rates between front and back seat passengers is the seat belt enforcement law. Having a law enforcing the belt on drivers and front seat passengers is an important factor affecting motor vehicle occupants' decision to wear or not to wear seat belts [4]. In UAE, and as was mentioned earlier, wearing seat belts is only compulsory by law on drivers and front seat passengers but not on rear seat passengers. Moreover, the 12.3% overall wearing rate found in this current study is also considered very low when compared to rear seat belt wearing rate in developed countries like, for example, the 62% wearing rate reported in USA [16]. This low wearing rate is believed to be a major contributor to the high death and injury rate recorded in UAE due to traffic accidents when compared to other countries [1].

As children are more vulnerable than adults to being injured in motor vehicle crashes, it is important to note here that the percentage of children restrained found in this study, which is 15.6%, is too low and indicates the extent of the problem severity. This low child restraining rate is consequently translated into a high death rate of 2.3 deaths among each 100,000 children in UAE due to traffic accidents, as compared to, for example, 0.4 deaths in Sweden, 1.2 deaths in Spain and 1.5 deaths in Australia [1].

Overall, survey results show that young and single people with a lower education level and of Arab and South Asian origin reported less wearing rates than others and less positive attitude towards wearing seat belts. It is also clear from the questionnaire results that reported seatbelt wearing rates are more than the percentage found in the observational study. Out of all respondents, 17.8% reported wearing seatbelts always or most of the time, and another 13.5% indicated wearing them sometimes, while only 12.3% were found to be wearing their seatbelts in the observational study.

Results of the current study show also clearly that introducing a law making wearing seat belts compulsory in back seats is urgently required to increase wearing rates. Survey results show that although most of the respondents do not wear their seat belts in rear car seats, 62.4% of them still support introducing a law to enforce it. This indicates that many motor vehicle users want the authorities to introduce such a law to motivate them to wear the seatbelt.

Another solution, which can be implemented alongside the first solution, is to improve awareness among all motor vehicle occupants. This can be done through public awareness campaigns through TV advertisements, social media, radio channels, newspapers, schools and universities, etc. Finally, modern concepts of law enforcement need to be introduced. One suggested example is using sensors on each seat that would trigger a warning signal in case of non-wearing of seatbelts that can be detected by advanced roadside sensors. Vehicle owners can then be warned or fined for this non-wearing.

ACKNOWLEDGMENT

The authors would like to thank Noura Al-Shamsi, Hadeel Abu Hadi and Marwa Alnaqbi for their help in part of the data collection process.

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