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RESEARCH ARTICLE

Identifying Traveler Groups Lacking in Seatbelt Usage and Suggesting Policy Measures

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HIGHLIGHTS

- *Analysis of seatbelt usage of travelers*
- *Hybrid data collection technique used*
- *Identification of important travelers at high-risk due to non-usage*
- *Policy recommendations to increase safety via seatbelt usage*
- *Presenting a global perspective with reference to seatelt usage*

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ABSTRACT

This study was aimed to identify the traveler groups who are exposed to potential of severe injury due to lack of seatbelt use. Moreover, policy measures have been suggested to enhance seatbelt use among such groups. A hybrid data collection approach was adopted to gather traveler information. Seatbelt usage questionnaire was used as the survey instrument. The survey was carried out in the parking lots of educational and commercial facilities around Bahrain. Statistical tests, namely, t-tests and Analysis of Variance (ANOVA), were used to compare the attributes of travelers. Literature review was used to verify the findings of this study and identify common traveler groups which are lacking in seatbelt use. The recommendations are also provided on policy measures which could be adopted globally to promote seatbelt use. It was found that occupation, education, gender, nationality and accident occurrence have significant impact on seatbelt wearing. It was also found that accident experience and seatbelt wearing, both are dependent on travelers' social and cultural background rather than each other. The findings of this study matched previous literature. Groups lacking in seatbelt use included male passengers belonging to lower- and middle-income groups which fits the description of expatriate workers in Bahrain. Some policy measures, appropriate to these groups, have also been suggested.

Keywords: *Seatbelt use, Travelers' characteristics, Hybrid data collection, Bahrain, Comparison*

I. INTRODUCTION

Road traffic accidents have been an issue of concern for many researchers in the past decades, especially with the increase in motorization globally. In this context, seatbelts are among one of the primary safety features for drivers and passengers. Seatbelts prevent ejection of drivers or passengers from the car-seat, in case of accident. Failure in avoiding ejection has 75% and 40% chances of fatality of drivers and passengers, respectively [1]. Seatbelt usage has been related to occurrence of serious injuries and fatalities among Gulf countries with a comparative increase of 52% in death rate with non-compliance [2]. A study done for Bahrain showed that fastening the seatbelt is an important indicator of driver behavior with regards to their tendency to get into accidents with an increase of 75% for those who do not comply with wearing seatbelts among students [3].

There have been several studies to investigate the effects of different factors on seatbelt wearing behavior. The use of seatbelts has been reported to be more among drivers than passengers [4]. Other variables, which have been tested for their significant effect on seatbelt wearing behavior include age, gender, awareness campaigns and previous accident experience. It was found that young males who do not have awareness and priori experience of accidents have higher likelihood of not using seatbelts [5]. The cultural differences in the travelers are also among the factors found to be affecting seatbelt wearing behavior, with a lesser likelihood of wearing seatbelts among non-natives in USA [6]. Education level has also been investigated for its effect on travelers' usage of seatbelts with an increase in use of seatbelt with increase in education level [7]. The same trend has been reported in the context of Gulf countries. Additionally, driver experience was also found to increase the use of seatbelts [8]. A study done in Saudi Arabia shows that compliance to seatbelt is higher in drivers as compared to front seat passengers by more than 30%. Compliance levels also increased with the increase in income level. Awareness campaigns coupled with strict police enforcement have also been found to increase use of seatbelts [9]. Aforementioned studies have primarily employed statistical tests for exploring the factorial impacts of traveler characteristics on seatbelt usage.

In some studies, the data was collected by asking the travelers about their preference to wear seatbelts instead of observing their actual practice [10]. On the other hand, studies employing the observational approach have been found to record a limited number of variables, such as age, gender and seating position [11]. Due to these reasons, some studies have employed data collection in two stages, including a survey and later on simulator/field measurements [12]. But this approach could have inconsistent results as the survey participants and field subjects are not exactly the same. Most of the studies found in this research area have been focused on specific types of travelers or limited to a specific region.

Significant impact of changes in traffic laws and policies on seatbelt wearing behavior has been recorded regularly. The strict enforcement is reported to have approximately 10% increase in seatbelt which was also directly proportional with the increase in amount of fine [13]. Consequently, seatbelt law has been reported as an effective measure for reduction in serious injuries and fatalities in UAE, Bahrain and Saudi Arabia [14]. In Bahrain, it has been reported to reducing the fatalities by 75% and serious injuries by 19% approximately during 1991-2001 [15]. In this context, it is important to know the traveler groups which must be focused on making new policies or adopting different law enforcement measures. Hence, this study focused on identifying types of drivers and passengers, around the world, who have comparatively lower use of seatbelt. A hybrid data collection approach was employed to gather information about travelers and their behavior. Moreover, effort was also made to include travelers from different sections of society in the dataset so that the results are comprehensive and not limited to specific segment(s) of population in Bahrain. The findings of the study were also compared with the global scenario.

II. METHODS

The primary data for this study was collected in 2016 for Bahrain. Bahrain has been experiencing a consistent increase in vehicle ownership and, consequently, number of accidents as well [16]. The fatalities in road accidents constituted 51% of total fatalities in Bahrain in the previous decade [17].

A. Questionnaire survey

A questionnaire was prepared to collect data about the travelers' characteristics affecting seatbelt usage. The survey was carried out in the parking lots of different types of locations of Bahrain. These locations included parking lots of the following facilities: shopping malls including Bahrain City Center, Juffair Mall and Hayat Mall, Prince Khalifa bin Salman Park and educational institutions; including University of Bahrain (Sakhir Campus) and Bahrain Polytechnic. The minimum sample size for each location type was kept as 100, to avoid any bias.

The number of surveyed travelers reached 800 participants. However, each respondent did not answer all the questions, so, the number of responses for each question was not 800. Table 1 represents the variables which have been used in the analysis from survey data while the number of valid responses achieved for each variable are mentioned in table 2.

Table I. Description of Variables

Variable	Description
Seating position	Categorical; driver and front seat passengers
Age	Continuous
Driving experience	Continuous
Education	Categorical; less than high school, high school pass, BS, MS and PhD
Occupation	Categorical; student, housewife, unemployed, self-employed, employed and retired
Gender	Categorical; male and female
Nationality	Categorical; Arab, sub-continent national (India, Pakistan and Bangladesh) and other nationals
Accident	Categorical; having or not having an accident

Table II. Statistical Comparison for Overall Data

Variable	Test Type	Result	Sample Size (n)
Seating position	T-Test	NS	317
Age	T-Test	NS	721
Driving experience	T-Test	NS	722
Education	ANOVA	S	261
Occupation	ANOVA	S	258
Gender	T-Test	S	345
Nationality	ANOVA	S	255
Accident	T-Test	S	795

Note: NS = difference is insignificant; S = difference is significant

The hybrid data collection approach, proposed in this study, was carried out in two steps. First, surveyors observed the usage of seatbelt for the randomly chosen traveler and then they approached him/her for the interview in the next step. So, the data was not skewed by the response of the traveler about their seatbelt usage. This hybrid approach study combines observational data with relatively detailed interviews giving the chance to investigate more factors with accurate observations of seatbelt usage.

B. Analysis methods

Table 1 presents the description of variables collected in the questionnaire. The questionnaire consisted of twelve questions. Most of the variables collected in this study were found in the previous studies as well, so it was possible to compare these traveler characteristics with other regions. The number of variables (number of parameters about the traveler) collected in this study are more than any other observational study found for seatbelt usage. Each question of the survey was analyzed, using either a t-test or analysis of variance (ANOVA), depending on the type of data. T-test was found to be used in previous studies for comparing means and proportions [18]. Whereas, ANOVA has been recommended to investigate the differences in various groups of a dataset [19]. A confidence level of 95% was used to test the significance of these tests.

III. RESULTS

The degree of compliance for seatbelt in the collected data was around 70%, which was found to be consistent at all survey locations. Table 3 presents the descriptive statistics of the traveler characteristics and seatbelt wearing behavior data. It can be observed that the compliance ratio is more than 50% for all categories of travelers. Travelers having higher education (above BS) and retired were found to be with highest compliance rates.

Table III. Descriptive Statistics of Overall Data

Variable	Value for wearing seatbelt	Value for not wearing seatbelt
Drivers wearing seatbelt	68% (422)	32% (198)
Passengers wearing seatbelt	58% (48)	42% (35)
Average age of travelers	31 years	29 years
Average driving experience of travelers	8 years	8 years
Travelers having less than high school education	67% (24)	33% (12)
Travelers having only high school education	69% (29)	31% (13)
Travelers having more than high school till diploma	83% (34)	17% (7)
Travelers having more than diploma till BS	69% (129)	31% (58)
Travelers having more than BS till MS	94% (30)	6% (2)
Travelers having more than MS till PhD	100% (5)	0% (0)
Students	62% (93)	38% (44)
Housewives	82% (32)	18% (7)
Unemployed travelers	50% (09)	50% (09)
Self-employed travelers	76% (32)	24% (10)
Employed travelers	84% (92)	16% (18)
Retired travelers	88% (7)	12% (1)
Male	72% (131)	28% (59)
Female	83% (121)	17% (34)
Arabs	83% (60)	17% (28)
Sub-continental nationals	68% (65)	32% (13)
Other nationals	57% (51)	43% (38)
Travelers having accident	76% (179)	24% (57)
Travelers not having accident	81% (453)	19% (106)

A. Factorial analysis

Table 2 shows the results of statistical tests for each variable in the data. The t-test was performed for the null hypothesis that there is no significant difference between average or proportion of drivers wearing and not wearing the seatbelt. It was found that gender and accident experience have a significant impact on use of seatbelt with higher proportion of use by female travelers and people without accident experience (as shown in Table 3). The later observation could mean that wearing seatbelt is a result of travelers' cautious behavior which also results in avoidance of accidents. While travelers who are less cautious about traffic laws (such as wearing seatbelts) are also more prone to accidents.

The ANOVA test was performed with the null hypothesis that there is no significant effect of education level, occupation and nationality on the proportion of travelers wearing seatbelts. The null hypothesis was rejected in all the cases.

B. Comparison with global context

A comparison of the findings of this study with those from previous studies conducted in other parts of the world, including Gulf countries, was conducted. The primary purpose of this effort was to identify groups of travelers who commonly lack seatbelts and should be focused on promoting the use of seatbelt. A selected number of studies are listed in Table 4 for convenience. Studies published before 2000 were not included as their findings may not be applicable to the current scenario. The table shows that most of the findings of this study coincide with those of previous studies.

Table IV. Overview of Variables in Global Context

Variable	Studies	Region	Conclusion
Seating position	Kulanthayan et al. [20]	Malaysia	Drivers have significantly higher proportion
	Bendak [9]	Saudi Arabia	
Age	Corona insights [21]	USA	No significant effect of age at 95% confidence
	Yellman [22]	USA	Almost equal proportion of teenagers wearing and not wearing seatbelts (reported from previous studies)
Driving experience	Al-Madani et al. [8]	UAE	Seatbelt usage increases with experience
Education	Al-Madani et al. [8]	Qatar	No significant effect
	Kulanthayan et al. [20]	Malaysia	Travelers with higher education (BS in this case) wearing seatbelts are twice than others
	Harper et al. [23]	USA	
	Al-Madani et al. [8]	GCC countries	Less educated drivers rarely use seatbelt
Gender	Birru et al. [24]	USA	Female travelers wearing seatbelt is 10-11% more than males
Accidents	Siviroj et al. [5]	Thailand	Prior accident experience was found to be a major motivation for seatbelt wearing

IV. DISCUSSION

Analysis done in this study, along with the comparison from previous studies, have resulted in the identification of following traveler groups which lack in use of seatbelt.

- Front seat passengers. This can be observed from tables 2 and 3 that the proportion of drivers wearing the seatbelt is significantly higher than that for front seat passengers. The reason could be that drivers receive formal training and, hence, become more cautious about obeying traffic laws, which is not the case for passengers who may not be licensed drivers.
- Male drivers. It has been investigated in the past that women, in general, are less prone to risk taking then men which could be the reason that their use of seatbelt is significantly higher than men [25, 26].
- Travelers from lower-middle income groups. This is a conclusion which is drawn from the fact that nationality, education and occupation has a significant impact on seatbelt usage (see table 2). Moreover, table 3 shows that non-Arab expatriates, unemployed/students and low education travelers have a significantly lower proportion of seatbelt use as compared to their counterparts. Possible reasons could be lack of education and understanding of traffic rules at the primary education level, non-familiarity with local conditions (such as for travelers from other nationalities), not having formal training for license and lack of attention to their own safety. This finding is substantiated by Al-Madani [27] who found a correlation for comprehension of traffic signs and seatbelt wearing.

Based upon the above observations, it is important to develop policies and strategies focusing on these groups in order to improve their safety. It is recommended to go beyond the traditional means of traffic education which is presently done through educational and driving schools. Use of social media and roadside campaigns may have a deeper penetration in the above-mentioned groups. Furthermore, devising campaigns with multilingual and audio-visual aids will help to educate the lower-middle income groups of travelers. These recommendations were also advocated by Bendak [9]. Traffic laws and their implementation, as stated earlier, do have a role in improving travelers' behavior but passengers should be also given same importance, as drivers, when implementing these laws. Front seat passengers, in spite of being exposed to the same risk of injury due to an accident, often get away with not following traffic laws related to their safety. The above recommendations can be applied globally, since the traveler groups lacking in use of seat belt use, seem to be the same across different countries.

An interesting observation was regarding the accident experience which was significantly lower for seatbelt wearing travelers. So, it could be concluded that accident and wearing seatbelt, both are dependent upon socio-cultural background of travelers rather than each other. More cautious drivers tend to avoid accidents and wear seatbelts. Hence, taking measures to increase the use of seatbelts may have an inherent effect on increasing caution by the travelers and reducing their accidents. This trend was also recorded in one of the previous studies [3]. Moreover, Tables 2 and 3 show that the number of participants who are non-compliant with seatbelt and have accident experience are significantly lower than their counterparts. So, there could be a possibility of causal relationship between these parameters. However, it could be only confirmed with more data including the accident severity which was not taken at the time of this study.

V. CONCLUSIONS

This study was aimed at identifying travelers who are less likely to use seatbelts and suggesting policy measures to enhance their seatbelt use. Data collected in this study, from Bahrain, was analyzed and compared with findings of other relevant studies. A hybrid data collection technique, combining observation of behavior and questionnaire, was used in this study. Statistical tests were used to determine the trends among the travelers.

It was found that females, travelers having higher education, housewives and Arabs had significantly higher compliance to seatbelt use than others. The findings of this study mainly coincided with those of previous studies. This was found irrespective of the region in which the studies were done, hence, the results of this study could be considered generic for travelers' seatbelt use.

Based upon these findings, it is recommended to use multilingual audio-visual measures for campaigns, while incorporating social media, to promote the use of seatbelts. A higher focus on implementing traffic safety laws for the passengers is also required. The hybrid data collection approach, applied in this study, seems to be effective in capturing the travelers' behavior accurately with a wider range of variables. For future studies, it is recommended that the effects of different seatbelt use promotion measures could be studied in the context of their effectiveness. These measures could be related to enforcement or driver awareness. Other possible directions could include development of behavioral models and incorporation of accident severity data.

STATEMENT OF CONTRIBUTION RATE

1st author contributed 60%, 2nd author contributed 40%

CONFLICT OF INTEREST

The authors declare no conflict of interest with any person, entity or institution.

RESEARCH AND PUBLICATION ETHICS

In the studies carried out within the scope of this article, the rules of research and publication ethics were followed.

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