PAST ACCIDENT EXPERIENCE FROM EYEWITNESS PERSPECTIVE IN ABU DHABI

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1. INTRODUCTION

Traffic accidents are the negative aspect we see on our roads on a daily basis that can be contributed mainly to human errors (Bener et al., 2004; Treat et al. 1977; Bener et al. 1994, Parker et al. 1995, Lajunen et al. 2001, Kontogiannis et al. 2002, Mesken et al. 2002), vehicle malfunction or road factors. Globally there is a tremendous increase in the frequency and severity of road accidents that lead to a huge losses in lives, serious injuries and car damage. Traffic accident may attributed to an error or errors in the traffic engineering city plan at the planning, design or operation of traffic related features (Pline, 1999). Problems in smooth mobility within or outside the city can cause serious accidents. Furthermore, failure to design the road network according to the AASHTO standards probably will increase the risk of accident occurrence. In traffic safety, the 4 E’s (FHWA Safety, 2013): (Enforcement, Engineering, Education and Emergency Medical Services) are the most dominant strategies that are coordinated together to reduce the accident hazard. This is strongly related to our case study where we focus on the 4 E's in assessing the traffic safety conditions in Abu Dhabi.

Literature presents extensive efforts to model and analyze road accidents worldwide (e.g., Bener et. al. (2008); Bener (2001)). Statistical approaches have been widely used by researchers in the literature to extract important patterns and relationships embedded in traffic accident data. Lord and Mannering (2010) provide an extensive review of the statistical methods being in used for decades to analyze traffic accidents data. Example of these methods include developing statistical models to highlight highway locations with traffic safety problems (Hauer, 1996; Stokes and Mutabazi, 1996; Tarko et. Al., 1996).

In UAE, the literature document a number of studies in the field of traffic safety as in the work of Abdelfatah et. al. (2013) that suggested a frame for Abu Dhabi police traffic monitoring and response center to speed the response effort of traffic police to accident scene. Another work along this line is the work of Al-Harthei et. al. (2013) who used a decision support system for a real-time, efficient and
geographic specific allocation of traffic police patrols in Abu Dhabi, UAE.

2. STUDY AREA

Abu Dhabi is the capital Emirate in UAE with a total population of 2.121 million (Statistics Centre - Abu Dhabi (SCAD), 2011). The large population growth over the past few decades creates excessive demand on infrastructure services mainly as related to traffic demand rates. Most federal agencies in UAE are located in the Emirate as well. This attracts large traffic volumes from both locals and expats seeking governmental services. As a result, traffic accidents take place on the city road network on a daily basis leaving large numbers of life losses, causalities and property damage. The objective of this research was to study the traffic safety problem in Abu Dhabi by interviewing affected local community in Abu Dhabi, UAE. The reasons of such accidents, accident setup, and impact are all covered in this study.

3. DATA COLLECTION & ANALYSIS

3.1 Traffic Safety Survey

For the purpose of this study, a UK based survey developed by ROPE MAKERS SOLICITORS (2014) law firm was used to interview road accidents’ affected local community in Abu Dhabi. The questionnaire reported data about different categories including injuries, vehicle details, accident details, and employment details.

Injuries data focused on showing the medical status before the accident and all injuries’ details related to the accident such as type of injury, treatment,…etc. Vehicle details provided in-depth information about vehicles involved in the accident and their insurance data. Accident details provided inventory about accident time, location, type, and all other physical parameters of the accident environment. Finally, employment data gave details about affected drivers/passengers jobs as related to how did the accident affect their work and economical losses they may had.

A total of 130 people were interviewed that had a past experience or involvement in a road traffic accident. Responses and comments from local community were assembled for further analysis (shown in next sections) to draw a complete image about traffic safety problem in Abu Dhabi.

3.2 Data Analysis

3.2.1 Injuries Details

Data related to injury was investigated in this part. The collected data included: medical status, type of injury, injuries appearance, unconsciousness as result of the accident, rehabilitation/physiotherapy, restrictions on domestic and social life due to injuries, wearing seat belt, ambulance service, hospital attendance and hospital overnight residency.

Medical condition for the persons involved in the road accident should be documented before and after the accident. Their status can be evaluated after the accident. The injury data is divided into three categories (Figure 1). The first and most dominant category was “healthy” that represent 89% of the interviewed people followed by “in pain before accident” category (8%) and then “under treatment” category by 3% only. This result indicates that most drivers have a good health status before getting involved in an accident.

Regarding the type of injury (Figure 2) that people suffered from after the accident, results showed that 68% had a soft injury, 31% had a bone injury and only one case of death (1 %) was recorded. According to other piece of data in this project, 73% of these injuries were felt immediately after the accident while 27% of the interviewed people felt the injury a while after the accident.

The consciousness level of the injuries was also reported after the accident. Results showed that 11% of the injuries are unconscious and other 89% are conscious. This can be interpreted by the fact that most accidents were medium severity and didn’t affect the injuries consciousness level. Same conclusions can be made for both rehabilitation/physiotherapy needed after the accident (Figure 3) and restrictions on domestic and social life due to accident injuries (Figure 4).

Regarding post-accident medical care needs, results showed that 12% are in need for rehabilitation/physiotherapy treatment and 88% were not. For restrictions on domestic and social life due to injuries data category, results indicated that 10% only were affected in this regard by the accidents.

Wearing a seat belt during an accident was also investigated (Figure 5). It was noticed that 33% of the interviewed sample were not wearing the seat belt at the time of accident. This is a serious violation that needs a further investigation.

The last three data categories related to injuries were medical services: ambulance service, hospital attendance, and staying in hospital overnight (Figure 6).

For ambulance service, 47% of accidents included attendance of an ambulance while 53% didn’t. Regarding hospital attendance after the accident, 31% needed hospital while the other 69 % didn’t attend the hospital. Finally for those people who attended hospital, results indicated that only 18% of them had to stay overnight or for more than one night.

3.2.2 Vehicle Details

This section analyzes the data related to vehicles involved in an accident that include type of vehicle, insurance, damages as a result of the accident, repairs cost, claims of repair, damages beyond repair and days without vehicle.
Past Accident Experience from Eyewitness Perspective in Abu Dhabi


Figure 1. Medical status

<table>
<thead>
<tr>
<th>Medical Status Percentage</th>
<th>Healthy</th>
<th>Pain</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Medical Status Percentage</td>
<td>89</td>
<td>8</td>
<td>3</td>
</tr>
</tbody>
</table>

Figure 2. Type of injury

<table>
<thead>
<tr>
<th>Type of Injury Percentage</th>
<th>Soft Tissue</th>
<th>Bone Injury</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Type of Injury Percentage</td>
<td>68</td>
<td>31</td>
<td>1</td>
</tr>
</tbody>
</table>
Type of vehicle data (Figure 7) presented four types of vehicles that were involved in road accidents. These include 4WD (36%), sedan cars (56%), sport cars (3%) and buses (5%).

Data related to insurance coverage (Figure 8a) showed that 92% have insurance for their cars while only 8% don’t have insurance. Out of the insured cars, 69% of them had a comprehensive insurance while 31% had regular insurance cover (Figure 8b). This indicates clearly the high level of enforcement in vehicles registration at Abu Dhabi. Also, most people tend to have comprehensive insurance since most of their cars are recent models (brand new).

Results related to vehicles’ damage after accident were presented in Figure 9a. Results showed that 83% of the vehicles got damaged as a result of an accident. Repairs’ cost for the damage was presented in Figure 9b. This question had been divided into four categories. Each category describes the amount that was spent for repairs. For less than 1000 DH (United Arab Emirates Dirham= 0.27 US Dollar) repair cost, 37 persons were in this range representing 28% of the surveyed sample.
Figure 6a. Ambulance service

Figure 6b. Hospital attendance

Figure 6c. Hospital overnight

Past Accident Experience from Eyewitness Perspective in Abu Dhabi
Figure 7. Type of vehicle

Figure 8a. Insurance cover

Figure 8b. Type of insurance

Figure 8. Vehicle insurance data
The second category (1000 DH - 4000 DH) represented 44% while the (4000DH – 10000 DH) category contributed to 17%. The last one (above 10000 DH) represented 11% of the sample. For these repair costs coverage, it was found out that 110 people (85%) submitted claims to fix their vehicles under their own insurance company and 20 people (15%) fixed their cars using the other accident’s party insurance.

Some of these car damages were beyond economic repair. It’s found that only 9% of these damages were beyond the economic repair while 82% of the vehicles didn’t exceed the economic repair, and 9% responded that they don’t have information about this.

The last question in the vehicle details category focused on how many days affected party stayed without a vehicle (Figure 10). The periods were divided into 3 categories. First category were up to (1 week) that represented 30%, the second category was between (1 week – 2 weeks) representing 41%, and the last category was (more than 2 weeks) and comprised 29% of the surveyed sample.

### 3.2.3 Accident Details

This section is one of the most important sections in this article. It focuses on analyzing a number of the critical accident inventories (time, location, reason of accident…etc) in an attempt to better understand the accident as perceived by local community. Starting with the date of the accident by year (Figure 11), accidents’ dates were categorized on the range from...
2008 until 2013. Year 2013 witnessed the largest percentage of these accidents (26%) while 2009 had the lowest rate of accidents (9%). The pattern that can be seen in Figure 11 showed that accidents frequency started to decrease from 2008 to 2009 then started to increase at 2010 and continued their increase with an excessive rate. The accidents’ increase rate decreased at 2013 compared to previous years.

![Figure 10. Days without a vehicle](image)

Second accident data category was related to accident location (Figure 12). Results revealed that 10 accident locations representing major arterials in Abu Dhabi were identified from the survey sample’s response. Morour street received the largest percentage of accidents (around 19%) while Mina street received the lowest with a value as small as 3%. This related mainly to two factors: driving speed and traffic volume. Morour is one of the most crowded arterials in Abu Dhabi with high speed limits (ranges from 60-100 km/h) with a very few traffic interruption sources (the street was designed with high AASHTO standards and connects the city with the outside suburbs). However Mina street was more of a collector road that is categorized by low speeds and higher level of traffic interruptions due to local shops and commercial/activities near the beach. Other roads' contribution to traffic can be analyzed in the same way to identify the roads (and in a better way the black spots) with high accidents levels to give them higher priority in investigation and engineering studies compared to low accidents density highways. Regarding details of the impact to vehicle due to the accident (Figure 13), results showed that the highest percentage was 30% for hitting in the rear of the cars category.
This might be related to the close distance between cars and high speeds. The second highest percentage was for involving vehicles changing lanes suddenly and it was around 29%. This is very common in Abu Dhabi as arterials can have many lanes in each direction (more than five sometimes) and drivers tend to keep swinging between these lanes. Other way of accident was the situation when there are more than two cars involving in one accident and it happened mostly when drivers did not leave enough space between the cars so they usually couldn't stop before hitting the vehicles in front of them and they called this way of accident (concert in collision); this category represented 15% of the whole accidents. In our survey results showed two equal percentages of accidents that happened on a round-about and accidents that involved hitting people while walking, and these two percentages were exactly 10%. Also it was found that there are 6 people made an accident while they are parking their cars and their percentage was around 5%. Last type of accidents was the accidents that happened after the car was parked and fully stopped, and there was only one case of this accident.

Driving speed is another factor that was studied in the accident details. As it’s one of the most important factors that have a large effect on the accidents’ level and the degree of injury; the study focused on driving
speeds that caused accidents. Driving speeds was divided (Figure 14) into five categories starting from 20 km/h to 120 km/h which was the highest speed in the survey. Driving speed between 60-80 km/h was the major contributor to accidents occurrence. The accidents details’ question regarding if the interviewed person was the driver or just a passenger at the time of accident showed that 89% of them were drivers and only 11% of them were passengers.

Weather conditions data showed that most accidents’ happened in a sunny and dry weather which means that weather had a minimal contribution to accidents occurrence. Same conclusion was made for road condition where most accidents (about 92%) happened on dry roads meaning that conditions of the road were good and not a main contributor in accidents.

Lighting factor data showed that most accidents (85%) happened in a bright condition during day time or with the presence of enough lighting in the night. This reflects the fact that lighting was not directly correlated to accidents’ occurrence.

One important question in the accidents details section was to measure the percentage of the people who did accidents in the last 3 years to see if they had a previous experience with accidents. It was found that 70 people reported accidents in the past 3 years, and their percentage was around 54%. This indicates the high level of involvement of the surveyed people in road accidents on a frequent basis.

The last and most important question in accidents’ details category was the reasons behind such accidents (Figure 15). In this part different reasons that caused accidents were studied. The highest percentage was for over speed making drivers unable to avoid the accident with 30% share. The second reason was not paying attention (probable reason was talking on the mobile) while driving with 24% followed by other/unspecified reasons with 17%. Came after that not leaving enough space and crossing the red light reasons with 16% and 13%, respectively.

3.2.4 Employment Details
This section studies the effect of accidents on affected people’s job status. Results showed that 36% of injured people did not attend their work after the accident while 64% did attend. The second data element in this category was about whether the affected person received payment from employer during off period. Results showed that 72% received a payment during period of absence while only 28% did not receive any payment.

3.2.5 Combined Variables Analysis
This section provides further analysis through linking two or more accident’s special variables to get more conclusions related to our accidents database.

3.2.5.1 Age – Gender Variables
Studying the relationship between age and gender categories (Figure 16) showed that the highest percentage of accidents was for the age group 18-30 yrs and was dominated mainly by male drivers. On the other side, the age group with the lowest contribution to traffic accidents was above 61 yrs and was dominated mainly be females. The rest of age group categories in between were dominated clearly by men.

3.2.5.2 Type of injury – Time of Injury
The relation between type of injury and time of feeling the injury, whether if it was immediately or awhile after the accident, was studied (Figure 17). Starting with the soft injury (highest percentage), it was found that around forty percent of the people felt the injury awhile after the accident while 60% felt the injury immediately and only 10% felt it awhile after the accident. The last single death case happened immediately during the accident.
Past Accident Experience from Eyewitness Perspective in Abu Dhabi

Figure 15. Reasons Details

Figure 16. Age – Gender variable
3.2.5.3 Seat belt – Attend Hospital
In this part the relationship between wearing the seat belt and how did it protect people from high level injuries that may lead them to attend hospital was studied (Figure 18). It was found that around 80% of the people who were wearing the seat belt did not attend the hospital, and only 20% of them attended the hospital. For the other people who were not wearing the seat belt; around 75% of them attended the hospital as result of their injuries, and 25% only did not attend the hospital.

3.2.5.4 Speed – Accident Reason Variables
The relation between driving speed and main accidents reasons were studied (Figure 19). First, it was found that people not paying attention reason was dominating other reasons in the speed groups 20 and 60km/h. For speed group with highest contribution to accidents, i.e. 61 – 80, and higher speeds above 80; it was found that the main reason for accidents was over speeding. Over speeding was very clear especially in speeds over 100 composing about 85% from all reasons. Also, it was found that there were many accidents related to crossing red light signals and to not leaving enough space especially at lower speeds (mainly below 80 km/h).
3.2.5.5 Driving Speed - Type of Injury

The last correlation was between driving speed and type of injury (Figure 20) to evaluate the effect of speed on injury level. It was found that the first three categories of speed, from 20km/h to 80km/h, had the highest percentage of soft injuries compared to bone injuries. On the other hand, it was found that the highest percentage of bone injury was in speed categories above 80km/h which was around 60%.

4. CONCLUSIONS

Results indicated that most accidents were caused by age groups between (18 – 30) years with the rate of accidents being decreased when the age increases. It was also found that the most affected street by traffic accidents in Abu-Dhabi is Al-Mourour street. This is because it includes many intersections and is associated with high speed limits. Another important category that was studied was the restrictions that may affect injured people social life due to the accident. This was obvious in the high percentage of affected people not attending their work as a result of their injuries due to the accident.

Combining age category with gender showed that males were mostly responsible for accidents in the young and middle ages while females were mostly responsible for the accidents in the elderly age. Another important result was related to wearing the seat belt. High percentage of injured people weren’t wearing the seatbelt at the time of accident which contributed to increasing the risk of high levels of injuries.

5. REFERENCES


Figure 20. Driving speed - Type of Injury