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Towards Improving Crash Data Management System in Gulf Countries

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Abstract
Scientific and analytical approaches to accident data collection, storage and analysis are essential in dealing with road safety problems. Police accident records in the majority of countries form the main (and sometimes the only) source of accident data. Access to the accident database is also important to identifying specific safety problems and evaluating the effectiveness of the countermeasure introduced.

Accident data collection and analysis offered by technological innovation such as Electronic Data Entry (EDE), Electronic Data transfer (EDT), and Geographic Information system (GIS) are implemented in developed countries. Developing countries, including the Gulf countries, should take advantage of the experience of developed countries on how the advance accident data management system works to identifying, more accurately, the main factors contributing to traffic accident.

The main purpose of this research is to provide information on accident statistics process in Virginia state, starting from the time of accident occurring until it is stored in the database, with the aim of using it towards improving the process of collecting and maintaining accident data system in Gulf countries. The task is performed by reviewing the relevant international literature and interviewing police officers in charge and academic researchers in order to compare the accident data management system and also the quality of the data. Recommendations towards developing the crash data management system will be obtained based on the research results and international experience.

Keywords: Accident database, Gulf countries, Accident Record System

I. Introduction

Gulf Cooperative Council (GCC) countries consist of six countries namely Saudi Arabia, Oman, Emirate, Kuwait Qatar, and Bahrain. Statistics show that the fatality rate per 100,000 population in the GCC countries are substantially higher than those in developed countries, in which the rate of selected 15 Europe countries were found to be steady decline toward vision zero (Al-Madani 2013). Al-Madani (2013) stated that the fatalities per 100,000 population was 13.5 in 1980s, which dropped to 5.5 deaths per 100,000 inhabitant recently. Whereas the fatality rate per 100,000 in the GCC countries remain constant over the same period. In 1980s the rate was between 22 to 27, it becomes around 23 deaths per 100,000.

Most of the GCC countries proposed road safety strategic plans to reduce accident and causalities. One of the key issue of these strategies is to improve the accident database which could promote a more detailed exploration of the causes of road accidents, and better understanding of the circumstances that leading to causalities.

An improvement of the data collection process will come up with significant findings that lead to potential countermeasures. An accurate road crash database is essential to determine the priorities and the results of each measure, and therefore to design any effective strategic plan. It is also necessary to have a reliable data and establish a proper and updated database system to collect, store and analyze crash-related information. Accident data collection and analysis offered by technological innovation such as Electronic Data Entry (EDE), Electronic Data transfer (EDT) would minimize invalid or incomplete information being entered into the report compared to filling the Crash Form manually. The more times data is manually coded, the more likely it is that mistakes will be made (Griffith, 2003; Pettit, 2002).

Cherry et al. (2006) stated that standardizing data-collection methods and accident forms, and incorporating Global Positioning System (GPS) will support data accuracy and spatial analysis. Geographical Information System (GIS) can also support safety auditing purposes and carrying out necessary studies such as black spot. The GIS can be utilized to merge accident and highway data, geo-code the accident data and locations, calculate frequency and rate of accidents, and select a variable for stratification to calculate the mean and standard deviation of accident rates (Liang et al., 2005).

An objective of this research is to evaluate the crash data forms and the process of data collection in Gulf countries. Another objective of this research is to perform a recommendation towards improving the crash data management process in gulf countries based on the comparative studies with the developed countries such as selected states from the united State and other International experience.

II. Methodology

The road accident statistics have been collected from the traffic directorate from each gulf countries in order to perform a comparison of accident rate between gulf countries and developed countries, which will provide insight information about road safety situation in recent years.

Police accident reports have been also obtained from traffic directorate for each gulf country to assess the report form based on the Model Minimum Uniform Crash Criteria (MMUCC) in terms of the existing crash data elements, vehicle data element and personal data elements.

A personal interview survey method has been implemented in this study. People who were interviewed are police officers and Academic researchers who are involved in the accident database in each gulf country. The interview questions are mainly about the process of collecting and maintaining accident data system. Also the same interview has been conducted with the data manger at Virginia highway safety office in USA.

Recommendation are extracted to enhance the crash data management system for the gulf countries based on the research results and other international experience.

III. Results:

3.1 Accident rate in gulf countries

It is relevant to make a comparison between countries of similar status. The statistic most often used to compare road safety records around the world is the number of persons killed for every 100,000 people. Figure1 shows a recent statistical data available of the fatalities rates in Arabian Gulf Countries which share the same culture. Kuwait's fatality rate per 100,000 population is the second lowest after Bahrain, while Oman is the worse and Saudi Arabia is not far off the Oman level. Although the fatality rate per 100,000 population in UAE and Qatar is higher than Kuwait and Bahrain , they have downward trend in recent years. However, the fatality rate for the GCC country showed a much higher rate than developed countries such as UK and Sweden where the fatality rate per 100,000 population are 2.75 and 3.0 respectively(Wikipedia 2012).

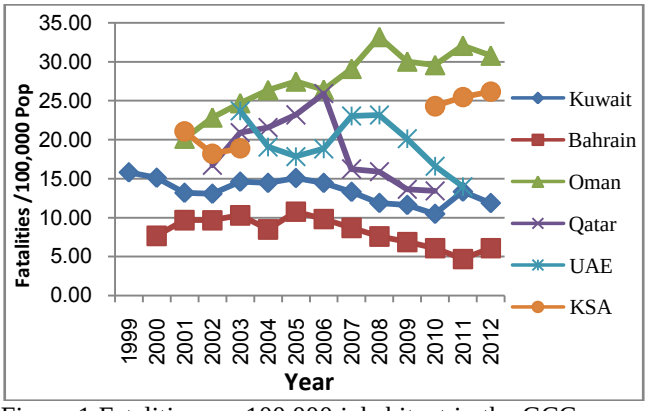

Figure 1 Fatalities per 100,000 inhabitant in the GCC countries (Sources: Annual Statistics from the Ministries of Interior of Saudi Arabia, Kuwait, Bahrain, Oman, Qatar and Emirates)

A better statistic to compare road safety records around the world is the fatality per 100 million vehicles-kilometers travelled. The difficulty of obtaining such rate lies in the availability of correct data or computation of vehicle-kilometers in developing countries.

It should be taken into consideration the topography in each country which could have an impact on accident rates. For example, the total land areas of Kuwait, Qatar, and Bahrain are relatively small compared to the Emirates and Oman, whereas Saudi Arabia is much greater than all of them. There is some rolling and mountainous terrain in Oman and Saudi Arabia, whilst Kuwait, Qatar and Bahrain have mostly level terrain (desert landscape).

3.2 Accident data process in gulf countries

It was found that the crash statistic process (starting from the time of accident occurring until it is stored in the database) are different among Gulf countries. In Kuwait, when the accident occurs the police patrol come to the accident location and fill a preliminary form which contains basic information such as vehicles plate number drivers names and little preliminary sketch of the accident and location then vehicles are removed from the accident locations and the drivers will go to the police station were the police investigator are there to investigate the accident sequences. The police Investigator then fill the police accidents reports which has more detailed information. If someone are injured the ambulance take the injured person to the hospital where there is also a police investigator in each hospital, in some situations the drivers leave the accident location and go to the police station to process the paper work for Insurance claims . The police investigator do not have to go to the accident location unless If he feel that it is necessary to go there. The information from the police report then will be entered manually to excel spread sheet by the by data entry person in

order to present it as a monthly or annual statistic report.

In Saudi Arabia (Riyadh)the police patrol goes to the accident location when receiving call for injury accident only, which may involve the attendance of ambulance and fire truck if needed. If a PDO accident occurs the private company (NAJM) will go to the accident location to investigate the crash unless if the driver does not have insurance or driver licence, the police officer have to go to these kind of crashes. Then police officer fill the accident report manually which consist of three copies, one for driver, one to be kept in the archive (folder) and one for the database entry person. Then data is entered manually to the excel spread sheet for the monthly and annually statistic report.

In Bahrain and Qatar the process look similar, when the police received a call in case of PDO accident and If the vehicles can move or remove safely, the police will tell the drivers to come to the nearest police station to process the investigation, then the police report is being filled (less detail in Qatar), then the data will be entered at the Traffic Management Administration were they have their own software for the monthly and annually statistic report . In case of injury accident the police came to the accident location and also the ambulance and fire truck if needed then the police officer will fill the police report in Qatar, but in Bahrain there is a more detailed accident report for injury accident need to be filled by special committee.

Oman (Masqat) the process in Oman is a bit different, when there is a PDO accident the insurance company will take care the investigation and filing the accident report unless if there drive does not have insurance or driver licence or alcohol involved . When an Injury accident occur, the police patrol go to the accident location to investigate the accident then the police investigator will fill a different police form manually with a narrative part. Three copies of the police will distribute to the court , police station and the statistics department where the data entry using excel spared sheet for the monthly and annually statistic report.

The electronic data entry (online data entry system), in Abu-Dhabi (UAE) has been introduced recently, when the accident occurs the police patrols goes to the accident location, then he entered and send the data electronically using his laptop to the traffic department. Sometimes the information are not completed for some reasons, for example, the accident investigations are not finished, the rest of the information will be entered manually to complete the accident report. The supervisor will detect the missing data that is not being filled and the police officer who is involved in this accident will be asked to complete the information. Abu Dhabi police use photographs and some integrated computer systems to capture the crash site information.

Based on the interview it sounds that using the GPS and GIS to identify the accident location are partially introduce recently in GCC countries. However, there is still insufficient data for accident location, although there some effort has been done on this area. For examples, in Bahrain the main concern of identifying the accident location are for injury accident. In Saudi Arabia (Riyadh) also introduced a black spot studies based on the road safety strategy in Riyadh as well as Abu Dhabi and Dubai. Kuwait also conducting recently a special case study at Hawally area.

3.4 Missing data and supervision in GCC countries.

Although there is some kind of supervision to double check the accident database, the academic researchers who were involved in accident database studies claimed that there is a missing data from the police report specially for the accident locations. They try their best to track the missing and more accurate data from other authorities such as ministry of health to conduct the research. Also they have concerns about the manual process of the data collection which could lead to missing data and the qualification of the people who involved in investigation and entering the data.

3.5 Injury accident definitions and linkage in GCC countries.

The definitions of fatal ,serious injury, slight injury accident are not clear. Some police officers mentions that the hospital will decide what kind of injury and there is a police investigator representatives in each hospital to follow up the accident. Also the degree of linkage between the hospital and the traffic department are not clear, although Abu Dhabi police claimed that a computerized linkage between the hospital and the traffic department is implemented recently. The definition of fatal accident which is the person who killed outright or who dies within 30 days as a result of an accident is on the way to apply in the gulf country. Bahrain and Saudi Arabia claimed that they applied the previous fatal accident definition and they employ the definition of a person being hospitalized for at least 24 hours as a serious injury.

3.6 Police accident report assessment based on MMUCC.

The purpose of the Model Minimum Uniform Crash Criteria (MMUCC) is to provide a necessary dataset describing the road traffic accident in order to improve road safety within the United State and national. MMUCC recommends that law enforcement should collect 77 of the 110 data

elementals at the accident scene, which include 19 crash data elements, 30 vehicle data element and 28 personal data elements, were each elements has several attributes. The remaining data elements should be obtained after linkage to the other state data files such as driver history, roadway inventory data, hospital and other health/injury data. The state which comply with a minimum set of standardized data element (about 75%) , will receive fund for crash data improvement from the National Highway Traffic Safety Administration (NHSA).

In this study MMUCC are employed to evaluate the dataset elements from the police accident Report for gulf countries with taken into consideration the different traffic environment and junction and road types and hidden items from the narrative part.

Table 1 shows the compliance levels and its corresponding percentages based on the availability of the attributes for each element in the report. For example, if the number of the attributes that are available in the crash report for a specific item is nearly the same as in the MMUCC, then this item will deserve 3 points of MMUCC attributes and the compliance level will be called "Full". If the number is more than the half of the MMUCC attributes then the item will deserve 2 points, whereas if the number obtained is less than the half of the MMUCC attributes then the item will deserve 1 point. If the item is not appear or the attributes are marginally mentioned the item will deserve 0 point.

Table 1 (0-3) points possible per element based on attribute matching count

Points number	Compliance Level	MMUCC attributes (%)
3	Full	100
2	High compliance	>50
1	Low compliance	<50
0	No compliance	0

Table 2 Assessment of crash, vehicle and person data elements for GCC countries based on MMUCC

County		
Bahrain	C	39/57
	V	53/90
	P	48/84
	Total %	**61%**
Kuwait	C	24/57
	V	39/90
	P	29/84
	Total %	**40%**
KSA	C	29/57
	V	35/90
	P	25/84
	Total %	**39%**
UAE (Abu Dhabi)	C	39/57
	V	52/90
	P	47/84
	Total %	**60%**

Table 2 shows a comparison of data elements of crash data element, vehicle data elements and personal data elements which are represented in the table as C, V and P, respectively. The table shows that all gulf countries do not reach the minimum percentage of compliance required (75%). Bahrain and UAE (Abu Dhabi) has more data elements in their police accident report among the gulf countries nearly 60 %. In Kuwait and Saudi Arabia, the percentage of compliance were about 40% . It was observed that Oman and Qatar police accident report has the lesser details. It was also found form Table 2 that the crash date elements has the highest percentage except in Kuwait where the percentage of the crash data elements and vehicle data elements are nearly the same. The lowest percentage of data elements are the personal data.

3.7 Virginia USA

In most states, police officers and trained investigators complete crash reports for nearly all reportable crashes that occur on public roads. Many states have made significant improvements in the quality and timeliness of their crash data systems by implementing, in addition to other improvements, electronic filing of these reports and transfer by police officers. (Monsere et. al . 2005).

The data manger at Virginia highway safety office stated that, the local and state law enforcement are the only personnel that can fill out the Police Crash Report. Virginia Traffic Records Electronic Data System (TREDS) is able to process data specific to local capabilities in 3 different ways. The majority of the crash reports are filled out digitally(72%) using the TREDS's front-end software and are submitted to the TREDS system at DMV electronically in real-time. In addition, a standardized electronic submission format will allow any agency with an existing RMS (records management system) to submit electronic transmissions to the central repository (TREDS data warehouse). This will allow law enforcement agencies with an existing automated front-end to maintain their process while streamlining the submission of the data to the DMV via an electronic submission.

There are still crash reports filled on paper manually and mailed to DMV. Any submitted paper report will be scanned into the TREDS system. Ultimately, this option is only used to back-up the process in the event of system downtime. Moreover the TREDS has a built-in workflow, accessible

online, for the supervisors to review all accident reports in their department before they send them to DMV.

Most of the police officers use the mapping tool in the front-end to identify the exact crash location in addition to providing the crash street/route, intersection, etc. Some small agencies, where the officers don't have the mapping tool to use, will identify the crash location by street/route information, intersection, secondary location, landmark, mile marker, railroad crossing id and crash diagram if applicable

Users are allowed to access TREDS based on an assigned role. Traffic crash information stored in TREDS can be accessed for several purposes. Law enforcement and the assigned DMV and VDOT staff are able to use the query tool to search for the Virginia Police Crash report. This function is not made available to the public.

Crash data is available for statistical reporting. Many reports are made available to local/state agencies and the public via the DMV website (dmvnow.com). The annual "Crash Facts" statistics are published on the DMV public website which includes 156 reports and tables. In addition, customized reports and map can be created based on the data provided fields.

The severity of the Injury type should be determined at the discretion of the police officer based on a combination of the injured person's statement, the observation of the officer and EMS personnel.

A fatal injury is an injury that results in death within 30 days after the motor vehicle crash in which the injury occurred. If the person did not die at the scene but died within 30 days of the motor vehicle crash in which the injury occurred, the Injury Type should be changed to '1. Dead' and Date of Death provided via revised report.

IV. Conclusions and Recommendations:

The findings of this study reveal that there is a need to improve the accident reporting system and to build up an accurate and relevant database in order to provide a reliable system for storing, retrieving and analysing data.The data collection process are in manual base in the most of gulf countries ,therefore, missing data and inaccurate information are being expected in this kind of process. Also, unclear supervision with not well train person for collecting and entering the data is an issue that it should be taken into consideration.

Gulf countries should take advantage of developments in computer technology. Electronic Data Entry (EDE) and Electronic Data transfer (EDT) supporting with proper supervision (edit checks) should be fully introduced to minimize missing and inaccurate data as well as utilizing of the GPS and GIS system to identifying the exact accident location in order to introduce a proper countermeasures, since research in many countries has shown that road planning, design and engineering countermeasures can lead to significant accident reductions and reductions in the severity of injuries.

Accident police form should be updated and have more detailed information of the cash data elements, vehicle data elements and personal data elements, in order to identify the most contributory factors of traffic accident and for conducting farther research as this was recommended by MMUCC.

The police should give greater priority to liaising with hospitals and thus collect more detailed and accurate information on serious road crash victims, i.e. those who are hospitalised. The police and the medical profession should work together to reduce under-reporting.

Accident databases should also be accessible to researchers, to encourage the analysis of accidents and the development of a better understanding of road safety characteristics and trends.

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