

## A Review of Strategies to Promote Road Safety in Rich Developing Countries: the Gcc Countries Experience

Khair Jadaan \*, Jamal Almatawah\*\*

*\*(Professor, Civil Engineering Department, University of Jordan, Jordan (Currently, visiting Professor, University of Auckland, New Zealand)*

*\*\* (Assistant Professor, Civil Engineering Department, College of Technological Studies, Kuwait (PAAET)*

### ABSTRACT

Road safety policies, strategies and action plans, along with trends in road traffic injuries (RTIs) in the oil-rich Gulf Cooperative Council (GCC) countries were examined to appraise their road safety work with an overall objective of identifying key measures and initiatives that would reduce RTA and their resulting consequences in these countries. Data on RTIs was obtained from police and from vital statistics and was analyzed. Research papers, policy documents, and strategies, obtained from relevant stakeholders in the six GCC countries, were reviewed and discussed. Traffic Safety Programs and action plans, which were the most fundamental documents in the development of the GCC countries' road safety policies and strategies, were reviewed. Policy documents on road safety and traffic related issues were searched on the websites of related authorities. Published research on road safety in GCC countries was searched using available databases. Analysis of accident data shows that the fatality rates in all the GCC countries are much higher than developed countries with good safety records. The six administrations started the fundamental traffic safety programs to combat the increase in RTIs, with some succeeding in reducing RTI rates by implementing vast road safety improvements. However, RTIs increased again mainly because of increasing traffic volume and high-risk driving behavior. Developing and implementing national road safety strategies in some GCC countries was successful in reducing the RTI rates. The road safety situation in the six GCC countries was assessed showing high crash and fatality rates compared to developed countries. Most GCC countries still suffer from sustainable increase in traffic crashes despite the efforts to reduce their magnitude and severity. Some of these countries have developed and implemented national road safety strategies, while countries like Oman still need to develop such a long-term strategy. Following the review of the current progress in road safety initiatives developed or implemented, it is apparent that there is still considerable room for improvement. In view of the fact that the oil-rich GCC countries have similar economic, social, and political background, a number of specific areas of action common to all countries were identified to achieve a safer road environment in the studied countries.

**Keywords:** Traffic accidents; GCC Countries; Injuries; road safety, strategies

### I. INTRODUCTION

The problem of road safety is acute in the developing nations including the rich ones. Road traffic injuries (RTIs) are greatly increasing because of rapid motorization and inadequate safety measures and are predicted to be the fourth leading cause of disease burden by 2030 unless effective measures are implemented [1, 2, 3].

In the oil-rich Arabian Gulf countries, many aspects of life changed shortly after the discovery of oil. There was an explosion in populations and vehicle numbers accompanied by rapidly expanding road construction programs. Unfortunately, patterns of behavior did not change so rapidly, resulting in a large number of casualties caused by traffic crashes [4].

The Gulf countries considered in this study are those which form the Gulf Cooperative Council (GCC) and include Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates (UAE). The

GCC countries are classified as high income countries with an income per capita comparable to the highly industrialized countries ranging from \$29,200 in Bahrain to \$103,900 in Qatar. Each of these countries host a significant proportion of expatriates who come from various parts of the world. Each carry different backgrounds, driving cultures, and training and testing systems, thus producing a heterogeneous road user population which is reflected on the road safety situation in the said countries. The estimated economic loss to the Gulf States from road crashes ranges between 2.5% and 4.5% of their Gross Domestic Product (GDP) [5].

This study carries out an appraisal of the road safety situation and road safety work in the GCC countries, with an overall objective of identifying key measures and initiatives that would reduce RTA and its resulting fatalities, injuries, and property damage in these countries.

## II. METHODS

This is a descriptive country-level study that uses different sources of related data. This data was compiled from the data sources in each individual administration, International Road Federation (IRF), World Bank Group, and World Health Organization (WHO).

The amount and quality of the available crash-related data varies among the studied countries. In general, detailed and reliable data on crashes and their main contributory factors are not available, especially those related to the amount of travel. The researchers also made every effort to ensure data consistency by using local and international resources such as IRF and WHO. The documents and traffic-related issues were searched on the websites of related authorities. Published research on road safety in GCC countries was searched using various databases and keywords.

Data of each country was obtained from their annual statistical reports on the number of registered vehicles, crashes, and associated deaths and injuries, population data from the Ministry of Internal Affairs and Ministry of Planning, and vital statistics data from the Ministry of Health, and Ministry of Labour. The most fundamental documents in the development of a GCC country's road safety policies and strategies were reviewed.

In order to achieve the objectives of the study, we examined the road safety programs, action plans and policies, along with trends in RTIs and fatality rates. Following that, we discussed the progress in the development and implementation of road safety strategies in the six administrations.

## III. RESULTS

### An Overview of Road Safety in GCC Countries

There are a number of bodies involved in road safety activities in the six countries, and the coordination between them seems to be a common problem in all the countries, leading to a certain amount of disagreement about where the main responsibility of road safety work should lie.

Deaths resulting from road crashes are less likely to be unreported in developed countries. However, the problem of underreporting can be serious for developing countries, including the rich ones [6]. Based on the available data, two fatality rate trends are analyzed; the number of fatalities per 1 million population and per 100,000 vehicles. The trends give an insight into the overall effectiveness of the road safety programs, as well as activities in these six administrations.

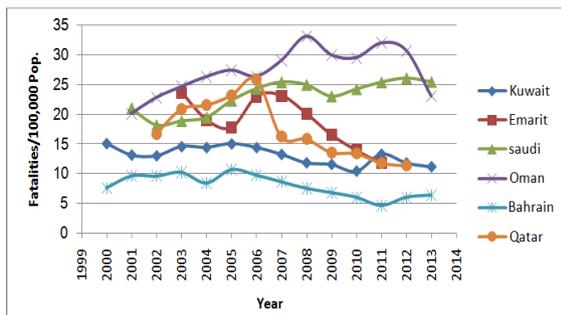
Fatality rates in the GCC countries are substantially higher than those in developed countries with comparable car ownership levels, and are growing fast [7, 8]. Accident prediction models developed for the GCC countries revealed that the

situation will further deteriorate in the future unless appropriate countermeasures are implemented [9, 10]. Table 1 summarizes the evolution of motorization and road safety levels in the GCC countries during the last four decades. It can be seen that all countries have motorization levels comparable to GB and USA, but far from having comparable road safety levels. Saudi Arabia, with approximately the same density of motor vehicles as GB, has about 8 times the fatalities per 10,000 vehicles of GB.

Table 1 also compares the levels and rates of road crash fatalities using a ranking from 1 to 6, where 1 is the lowest fatality rate and 6 is the highest fatality rate. The grading in 2012 mainly reflects the magnitude of the fatality rates across the administrations; it does not reflect the rate of change over time. Significant improvements are noticed in the countries that developed and implemented their national road safety strategy, such as Bahrain and Qatar. Oman, however, which still does not have such a strategy, shows the lowest levels of road safety. Figure 1 shows the variation of fatality rates between 1999 and 2012 in the GCC countries. It can be seen that Bahrain and Kuwait have the lowest and the most consistent trend among all countries. Oman has the highest rates with an increasing trend until 2008 when the rates started to decline. The available data for Saudi Arabia shows it to have the second highest rates not far away from the Oman level, but with a consistently increasing trend. Although the fatality rates in UAE and Qatar were higher than Kuwait and Bahrain, both countries show a downward trend in recent years, reaching comparable levels to Kuwait. Until recently, Bahrain showed consistent rise in fatality rates, but at a slower rate than other GCC countries. The impact of implementing parts of the national road safety strategy in 2008 was exhibited on the reduced crash and fatality rates.

**Table 1** Evolution of road safety parameters in the GCC countries

Country	Bahrain	K.W	Oman	Qatar	S.A	U.A.E	GB	USA
Vehicle ownership 1982	.21	0.41	0.12	0.53	0.34	0.35	0.31	0.68
Vehicle ownership 2012	0.41	0.43	0.27	0.49	0.54	0.48	0.54	0.81
Rank in 2012	5	4	6	3	1	2		
Fatalities per 100000 population 1982	20.2	33.2	38.8	45.5	29.8	42.9	11	18.8
Fatalities per 100000 population 2012	6.07	11.87	30.78	11.38	26.15	11.81	3.5	11.6
Rank in 2012	1	4	6	2	5	3		
Fatalities per 10000 vehicles 1982	9.23	8.0	32.4	8.49	9.78	12.23	3.5	2.71
Fatalities per 100000 vehicles in 2012	1.48	2.76	11.54	2.33	4.80	2.47	0.62	1.36
Rank in 2012	1	4	6	2	5	3		



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

In 2013 the vehicle ownership in Kuwait was 0.41veh/person. The same year showed 445 fatalities and 8,977 injuries with 3,448,815 traffic violations, increasing to an alarming number of 6,574,327 in 2014. The most common traffic violations were found to be speed limit offenses (73% of total) and running red traffic lights (14% of total) [11].

In Oman, the total number of registered vehicles reached 1,106,880 in 2013. More than 900 people died and 11,000 were injured in road crashes that year. One third of all accidents are caused by drivers who run red lights, with speeding, texting while driving, and general negligence. A total of 3,889,301 fines were imposed in the same year for various traffic offenses [12].

In Qatar, recent figures show that the number of registered vehicles is estimated to be 1.2 million in 2014. Around 220 people lose their lives and a further 500 are seriously injured each year as a result of traffic crashes. A total of 341,170 traffic violations were recorded during 2014, the majority of which involved stunt driving and overtaking from right. However, in the same year, the Qatari population grew by more than 11%, the number of registered vehicles increased by over 10%, and the number of driving licenses issued rose by more than 15%.

Road crashes in Saudi Arabia have been one of the highest in the world [13, 14, 15]. According to available statistics, the total number of registered vehicles was around 15.9 million in 2012. About 544,000 crashes occurred, causing the death of 7,153 people. On average, 19 people are killed every day and three out of four fatal crashes are reported as being related to speeding.

More recent statistics are available for Dubai. In 2014, a total of 1.4 million vehicles were registered where 2,588 serious traffic crashes occurred and 159 people died in traffic crashes. Dubai, the city with a vision of zero fatalities by 2020, has had 1.3 million speeding violations and

12,030 incidents of motorists running a red light [16].

The above results show that the fatality rates in all the GCC countries are high, calling for the need to develop and implement actions, programs, and strategies to improve the road safety situation in these countries.

#### IV. DISCUSSION

##### Injury Prevention Policies, Strategies, Interventions and Plans of Action in GCC Countries

The GCC countries have developed their national road injury prevention policies, strategies, and plans of action, which may vary in nature and scope, but serve the same purpose. In general, prevention strategies in the GCC countries have been mainly implemented for vehicle occupants, whereas little attention has been paid to more vulnerable road users such as pedestrians and cyclists. The following part reviews and discusses the road safety initiatives in each of the GCC countries.

##### 4.1 Bahrain

In Bahrain, the road safety stakeholders are many, which include Traffic Control Board, Ministry of Roads and Housing, Ministry of Education, Ministry of Health, Ministry of Interior, General Directorate of Traffic, and Ministry of Transport.

A national road safety strategy was developed in 2007 in consultation and discussion with all stakeholders to ensure that it is practical and implementable. The strategy elements include the target of 30% reduction in fatalities and serious injuries by 2016, using 2006 as a baseline. The strategy included requirements for successful implementation, such as the highest possible level of political support, and available sustainable financial resources.

In developing the strategy, the road safety system was divided into seven sectors. Each sector was weighted based on its relative importance to the safety system and then evaluated [17].

The achieved progress includes activities such as the formation of Strategic Road Safety Unit from all stakeholders, securing budget for implementation, and achieving many initiatives such as formalizing road safety audit procedures and reviewing of speed limits. A B C analysis revealed a minimum rate of return of 6 to 1.

##### 4.2 Kuwait

The road safety situation in Kuwait has been unsatisfactory over the years, recording high crash and casualty rates [4, 7]. Transport activities are currently under the responsibility of the

Ministries of Public Works, Communications, Interior and Health, and Kuwait Municipality. Recently, the General Road and Transport Authority (GRTA) was established in 2014 to manage all activities of the transport sector in Kuwait.

The accident data form used fails to include all relevant information, which is necessary to develop effective road safety programs. This is aggravated by the lack of data exchange between the various stakeholders and the problem of under reporting which may produce up to 40% difference between the official and actual figures [8, 18].

A long-term (2011-2020) National Transport Strategy was developed in 2009 with the main aim of reducing the magnitude and impact of road crashes [5]. The implementation of the National Road Safety Improvement Project has fulfilled the requirements of the UN Decade of Action 2011-2020 Plan which has been endorsed by Kuwait. Among many, the project will bring such benefits as creating an electronic system to overcome current manual-paper data practice, reduce severity, frequency, and cost to the community of road crashes, and strengthen law enforcement.

The project has achieved 97% of the approved 2013 Work Plan components, including 8% reduction of 2013 fatalities and 15% reduction of injuries, awareness raising activities, and significant traffic law enforcement improvements. Furthermore, programs such as the use of speed cameras and traffic awareness programs were introduced.

#### 4.3 Oman

Based on oil revenue, Oman has witnessed substantial social and economic changes in the last few decades reflecting negatively on road safety, with an increasing number of fatalities and injuries [12]. The data analysis suggests that Oman needs to invest more in road safety measures.

There has yet to be a national road safety strategy for Oman, but the National Committee for Road Safety (NCRS) and other stakeholders such as Royal Oman Police, carry out road safety activities to reduce RTI mainly through education and increasing awareness. One important milestone activity is Oman's 5-day National Traffic Safety Symposium, which concluded with the adoption of 20 recommendations to improve road safety in Oman. The main recommendations include: drawing up a national traffic safety strategy from 2011-2020, establishing a national center for road traffic information, providing intensive traffic education, and improving emergency and ambulance services.

#### 4.4 Qatar

Qatar has benefited greatly from increased political support for road safety initiatives. This culminated in the recent formation of the National

Traffic Safety Committee (NTSC) in 2010 and the inclusion of road safety targets in the Qatar National Development Strategy (2011- 2016) [19].

The National Road Safety Strategy (NRSS) sets casualty reduction targets of 10 and 6 fatalities per 100,000 people by 2016 and 2022 respectively, and a reduction in the annual number of seriously injured people from 33 to 15 per 100,000 people. The Road Safety Action Plan provides the link between the Road Safety Strategy and vision/targets. It aims to raise road safety performance in Qatar through an ambitious program of 200 activities and projects to be implemented by 13 government and semi-government agencies over five years (2011 - 2016).

The NRSS was launched by the NTSC in 2013 and designed to improve road safety in Qatar over the next 10 years. The resulting strategy has been developed using the Safe System principle, which is based on anticipating and accommodating human error and is structured around safe road users, safe vehicles, safe roads, and safe speeds. The progress that has been made includes efforts such as an update to the Qatar Traffic Law, introduction of a penalty points system, installation of red-light and speed cameras, development of Road Safety Audit guidelines, and the development of world-class emergency medical services.

#### 4.5 Saudi Arabia

The rapid expansion of the road network and the increasing number of vehicles in Saudi Arabia, has resulted in road crashes becoming a serious public health problem [13, 20], with one person killed and four injured every hour [14]. Many efforts have been made recently to improve this record, starting with the implementation of road safety strategy between 2003 and 2012. The main goals of this strategy were the evaluation of the road safety situation, the identification of the appropriate remedial measures, and the proposition of optional strategies for future implementation.

Another action was taken when the country launched a traffic control system called SAHER, with the purpose of minimizing crashes and maximizing the overall traffic efficiency. SAHER is basically an Automated Traffic Violations Administering and Monitoring Program, with the main goals of increasing driver and residents' safety and assisting the police in monitoring traffic violation and maintaining road safety [21].

Further actions include updating the emergency medical system, introducing the rescue helicopter, and intensifying awareness campaigns and driver education programs. A more important action has been the placement of cameras on highways to control high speed. However, the implementation of all these actions to control RTIs is

still inadequate and the coordination between all sectors involved in road traffic and road safety is still very weak.

A preliminary diagnostic analysis of the road safety activities in Saudi Arabia showed some gaps to be addressed [14]. Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis showed that the strengths of the road safety interventions lie in the strong motivation and commitment that exists among all sectors to decrease the number and severity of RTIs. This includes an increased awareness among drivers for the need to combat the problem.

The most significant challenge is the difficulty in changing the behavior of young drivers aged 21 years and younger, and the control of high speed driving. The opportunities lie in the willingness of all stakeholders to implement electronic control of speed by placing speed cameras in many streets and highways.

The most concerning threat is the low level of awareness among adolescent drivers and their resistance to speed control regulations. This needs to be managed through comprehensive psychological ways using improved methods of convincing and communication.

#### 4.6 United Arab Emirates (UAE)

The Department of Transport (DoT) is the main road safety stakeholder in the Emirate of Abu Dhabi. The department initiated a joint safety committee to monitor the situation within the emirate, bringing together Abu Dhabi Police, the Urban Planning Council, the Department of Municipal Affairs, and Health Authority. A road safety plan and a code for motorists were developed, but they need to focus on pedestrians, speeding, and young drivers [22].

As a result of these and other road safety measures, the number of RTIs dropped in 2013, as compared to 2012 by 9.7 percent. Fatalities decreased by 21.3 percent over the same period, and the number of pedestrian deaths decreased by 16.5 percent. Abu Dhabi still needs a comprehensive, coordinated, and integrated road-safety strategy to reduce crashes and cut road fatalities.

In Dubai, the Roads and Transport Authority (RTA) was established in 2006 with the vision of safe and smooth transport such as designing, constructing, maintenance of road infrastructure, and road safety improvement programs [16]. Various traffic safety improvement projects and schemes were introduced. These include Road Safety Strategy, Pedestrian Safety and Mobility Action Plan, Road Safety Auditing, work zone improvement, speed management, and traffic awareness. Traffic calming measures were introduced in residential and school zones, and new

standards and manuals based on best international practices were adopted.

As a result of these efforts, the number of fatalities in Dubai reduced significantly between 2006 and 2012, and the fatality rate per 100,000 population reduced from 21.9 in 2006 to 5.8 in 2012.

## V. AREAS OF ACTION FOR ONGOING ROAD SAFETY IN GCC COUNTRIES.

Road user factors are often the biggest contributors to traffic crashes in the GCC countries with reckless driving, and lack of observance to traffic regulations are among the main factors. [11,12,16,21].The road network is expanding fast in the GCC countries, with improving maintenance standards, but there is still potential for improving the road safety standards of these networks, such as improved street lighting and installing guard rails.

All GCC countries have high technical standards for newly imported vehicles and for vehicles in use that ensure road worthiness of motor vehicles. However, the level of implementing these standards is not as high as the standards and requires a lot of attention and revision.

In view of the above, some common important work which provides future efforts towards improving road safety in GCC countries includes, but is not limited to, the specific areas of action below. These actions are based on the application of the five Es (Education, Enforcement, Engineering, Encouragement, and Evaluation) and the two Cs (Coordination and Cooperation).

Updating of Traffic laws and introducing a penalty point system based on the analysis of violations.

Development and updating of highway and traffic manuals, standards, and guidelines. These include documents for design, Road Safety Audit, and work zones.

Development of materials and guidelines for road safety education in school.

Introducing a world –class emergency medical services system. Allocation of sufficient funding and resources. Continuous cooperation and coordination between the various stakeholders at all levels; national, regional, and international. Adopting a system for the evaluation of road safety performance. Developing and implementing national road safety strategies focusing on pedestrians and young drivers.

It should be noted, however, that measures that are very successful in achieving major benefits in certain countries, may not be that successful in other countries. This is mainly due to the complexity of the inter-relationship that exists among traffic variables and driver attitudes. It should also be noted that some of these measures are already

implemented in some GCC countries or included in their strategies.

## VI. CONCLUSIONS

This work has shed some light on the road safety situation in GCC countries. The results of the investigation reveal that the magnitude of the problem is and continues to be high compared to developed countries and that most GCC countries still suffer from sustainable increase in traffic crashes despite the efforts to reduce their magnitude and severity. These efforts were culminated in developing national road safety strategies in some GCC countries, and implementing them in other countries. There are, however, countries like Oman still needing to develop such a long-term strategy. The review of current progress in road safety initiatives developed or implemented indicate that there is still considerable room for improvement. In view of the fact that the oil-rich GCC countries have similar economic, social and political background, a number of specific areas of action common to all countries based on the application of the five Es (Education, Enforcement, Engineering, Encouragement, and Evaluation) and the two Cs (Coordination and Cooperation) are identified.

## REFERENCES

- [1]. Nakahara S, Ichikawab M, Kimurac A. Population strategies and high-risk-individual strategies for road safety in Japan. *Health Policy* 2011; 100:247-255.
- [2]. Peden M, Scurfield R, Sleet D, Mohan D, Hyder A, Jarawan E. *The World Report on Road Traffic Injury Prevention*. Geneva, Switzerland: World Health Organization; 2004
- [3]. World Health Organization (WHO). *Global Status Report on Road Safety: Time for Action*. Geneva, Switzerland: World Health Organization; 2009.
- [4]. Jadaan, K S. Traffic safety in Gulf countries with special reference to Kuwait. *Transport Reviews* 1988; 8:249-265.
- [5]. UNDP & General Directorate of Traffic. *National Traffic & Transport Sector strategy for Kuwait 2009 -2019*. Kuwait; December 2009.
- [6]. Bhatti J A, Salmi L. Challenges in evaluating the decade of action for road safety in developing countries: A survey of traffic fatality reporting capacity in the Eastern Mediterranean region. *Traff. Inj. Prev.* 2012; 13:422-426.
- [7]. Al-Matawah, J, Jadaan K. Road fatalities in Kuwait: trends, prediction and strategies, *Global Journal of Advanced Engineering Technologies* 2015; 4:207-211.
- [8]. Al-matawah, J. Towards Improving Crash Data Management System in Gulf Countries. *International Journal of Engineering Research and Applications* 2014 ; 4 (9), 35-40.
- [9]. Al-Matawah, J and Jadaan, K. S. 2009, Application of Prediction Techniques to Road Safety in Developing Countries, *International Journal of Applied Science and Engineering*. Vol. 7, 2: 169-175
- [10]. Bener A, Hussain SJ, Al-Malki M, Shotar MM, Al-Said MF, Jadaan KS. Road traffic fatalities in Qatar, Jordan and the UAE: estimates using regression analysis and the relationship with economic growth. *East Mediterr Health J.* 2010;16(3)318–23
- [11]. General Directorate of Traffic ( GDT,) *Annual statistics: road accident and accident injuries in the state of Kuwait*; Kuwait 2014.
- [12]. Al-rees H , Ganguly S , Al-adawi S , Laflamme L, Hasselberg M, Al-maniri A. Growth, motorization, and road traffic injuries in the Sultanate of Oman, 1985–2009. *Traffic Inj. Prev.* 2013; 14: 322–328
- [13]. Al-Shammari N, Bendak S, Al-Gadhi S.. In-depth analysis of pedestrian crashes in Riyadh. *Traffic Inj. Prev.* 2009; 10(6): 552–559.
- [14]. Al Turki Y A. How can Saudi Arabia use the Decade of Action for road safety to catalyse road traffic injury prevention policy and interventions? *International Journal of Injury Control and Safety Promotion* 2014; 21(4): 397–402.
- [15]. Al-Zahrani A, Jadaan, K. Current traffic safety issues in Saudi Arabia. *J. King Saud Univ. , Eng. Sci.* 1995; 7(1): 151-162.
- [16]. Bin Adai M, Al Banna H Successful road safety initiatives in Dubai *Inj Prev* 2012 ; 18:A1-A2.
- [17]. Shawqia H. Al-katib M. Development of road safety strategy-kingdom of Bahrain; Arab Mashreq Road Safety Partnership Workshop; 2008; 21-22 October, Doha, Qatar.
- [18]. Bener A, Abu-Zidan FM, Bensiali A K, Al-Mulla, A A, Jadaan K S. Strategy to improve road safety in developing countries, *Saudi Medical Journal*, 2003; 24:603–608.
- [19]. National Traffic Safety Committee (NTSC), the National Road Safety Strategy, Qatar; 2013.
- [20]. Bener A, Jadaan, K. S. A perspective on road fatalities in Jeddah, Saudi-Arabia, *Accident Analysis and Prevention* 1992; 24:143–148.
- [21]. Yassen J. Drivers' perception of Saher traffic monitoring system in Jeddah, Saudi Arabia" *Masters Theses & Specialist Projects*. Paper 1438; Saudi Arabia, 2014.
- [22]. Ramona R. UAE road safety plan should focus on pedestrians, speeding and young drivers. *The National* 2013; October 25.