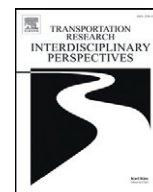




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# The challenges impeding traffic safety improvements in the Kurdistan Region of Iraq



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### ABSTRACT

Due to the stability and economic development in the Kurdistan Region of Iraq (KRI) relative to its neighbors after 2005, the density of the population and number of vehicles have increased dramatically. This situation produced certain undesirable consequences socially, administratively, legislatively, technically, and economically. An increase in the number of traffic crashes was one of the serious challenges that local authorities faced. The objective of this study is to address the challenges of traffic safety improvement in the region. Based upon existing traffic-related situations in the KRI, some fundamental and priority recommendations are proposed such as improving traffic regulations and guidelines, creating a traffic crash database, and starting traffic safety training and education. It is crucial to address the challenges of impeding traffic safety improvement in the KRI.

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## 1. Introduction and background

The Kurdistan Region of Iraq (KRI) is an autonomous region in the north run by the Kurdistan Regional Government (KRG). The KRI consists of four governorates, Erbil (the capital), Sulaymaniyah, Dohuk, and Halabja, (Fig. 1). The KRI has a population of 5.2 million, and in addition, there are currently 1.8 million forcibly displaced people who fled from Syria and other parts of Iraq due to armed conflicts (International Organization for Migration, 2017; Toperich et al., 2017). Partially due to this mass population movement, the region is encountering several challenges. One of the major challenges has been an increase in the number of traffic crashes.

Traffic crashes are the leading cause of deaths in the KRI (Rudaw, 2017). According to the Ministry of Health in the KRI, traffic crashes kill 3 people and injure 28 people daily in the KRI, which means about 850 deaths and 10,000 injuries annually (Rudaw, 2017). However, According

to data of the Ministry of Interior- General Directorate of Traffic (GDT), from 2014 to the end of 2016, 2449 people were killed in traffic crashes (16.12 deaths/100,000 people) and 35,222 were injured (231.8 injuries/100,000 people) in the region (Barzinjy, 2017). Despite this discrepancy between data, the number of fatalities is still excessively high and continues to increase as per both sources. The risk of being killed or injured in a crash is much higher on highways and in some regions than in others, as road safety varies across the KRI. Between 2010 and 2013, the KRI had the highest number of fatalities in comparison to other locations in Iraq (Leidman et al., 2016). The highest rate of road traffic injuries and fatalities is in Erbil (Leidman et al., 2016). According to the Ministry of Interior- General Directorate of Traffic's data, in 2017, there were 4410 traffic crashes in the KRI where 689 people were killed (13.68 deaths/100,000 people) and 7249 were injured (KNNC, 2018). Fatal crashes have increased sharply (almost doubled) in Erbil, increasing from 111 fatalities in 2016 to 219 in 2017 (NRT, 2018). The traffic fatality rate is high in comparison to other countries. For instance, traffic fatalities per 100,000 people in 2016 in Israel, Sweden, and the UK were 4.2, 2.8, and 3.1, respectively (World Health Organization, 2018).

Formal traffic reports show that about 60% of the crashes occurred due to speeding while the rest were caused by driving recklessly, disregarding road signs, and aging roads. In order to increase public safety on the road, traffic police officers administered traffic tickets to deter traffic law

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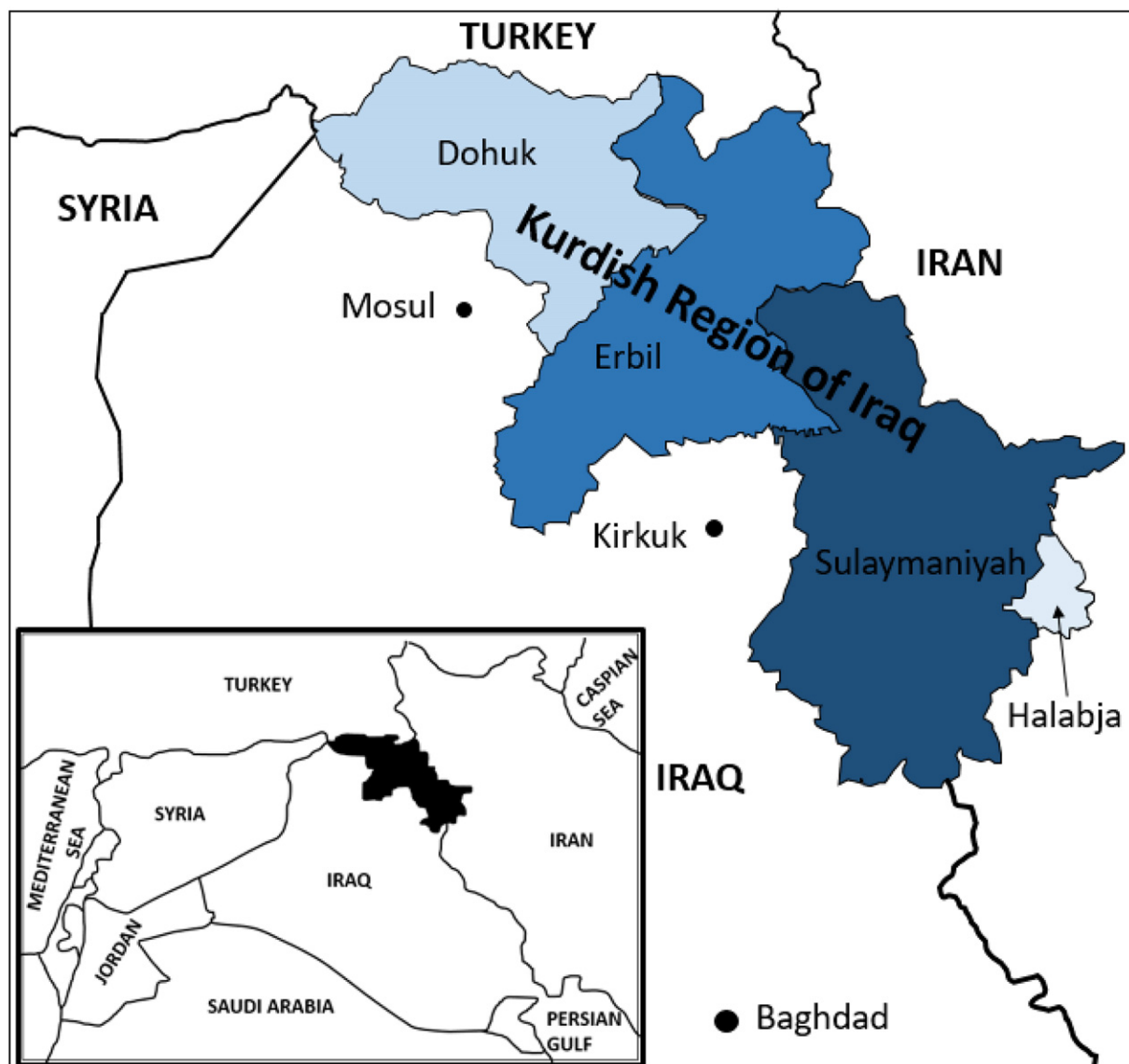


Fig. 1. Administrative map of Kurdish Region of Iraq.

violations and reckless driving practices. In 2017, the number of registered traffic tickets in the KRI increased by 180,000 (13.6%) and the number of fatalities decreased by 18.6% in comparison to 2016, but injuries increased by 26.7% (K24, 2018). These after-effects indicate that traffic safety is correlated with various factors and traffic tickets alone will not solve this issue. Law enforcement should be only one component of any safety improvement plan, which comprises the 4Es (education, enforcement, engineering, and emergency medical services). Enforcement is a means of last resort to change driver behavior and its importance is evidence to the salience of motives other than safety and an indication of the failure of the driver education, training, and licensing process (Shinar, 2017).

This paper describes the outcomes of road traffic crashes and the challenges in addressing this problem, and it suggests recommendations to improve road safety in the KRI.

## 2. Health and economic consequences of crashes in the KRI

It is evident that road traffic crashes are affecting the well-being and economic status of the population in the KRI. In Erbil, traffic crashes are the second leading cause of death (Jrew et al., 2017). These estimates may be low, especially when acknowledging under-reporting cases is common in the region (KRG, 2017). As the number of deaths and injuries

continue to increase, the need for attention to the short- and long-term consequences is urgent.

Short and long-term impacts of traffic injuries are not well documented in the region and therefore little is known about these consequences. Given the high rates of death, however, it is likely that an increasing number of injured people are living with long-lasting physical and mental disabilities and impairments because of crashes. The literature related to road fatalities and injuries suggests that deaths also have intense psychological impacts on the families of those killed and on the many survivors (World Health Organization, 2016). For example, many survivors suffer from psychological disorders such as post-traumatic stress, depression, and anxiety for some extended period after the crash (Jaff, 2018).

Evidence suggests a strong association between social status and road accident risk (European Transport Safety Council, 2007). Studies show that individuals with low social status are more often involved in crashes than individuals with high social status. Variables of social disparities in road accident risk include education, income, quality, and characteristics of a residential area, or any combination of these variables, although these data are not currently described for the crashes in the KRI.

Traffic crashes are also associated with immense direct and indirect financial costs, which include pre-hospital, hospital, physiotherapy, and rehabilitation, property damage, administrative and funeral costs. It is

estimated by the World Health Organization (WHO) that the annual cost of crashes in Low- and Middle-Income Countries (LMIC) is between 1 and 2% of the gross domestic product (GDP) (Peden et al., 2004). Although data to estimate the financial burden in the KRI are scarce, a recent report suggests that the KRI loses 20 million USD annually due to road traffic accidents (Abdulla, 2018). Documented financial losses resulting from crashes may assist local Kurdish authorities in adjusting budgets and allocating higher funding for road safety (Abdulla, 2018).

### 3. Identification the challenges

The reasons behind this dramatic increase in traffic crashes belong to various factors. Some of the direct factors are; fluctuation in the demography of the KRI; shortcoming in traffic-related guidelines, rules, and regulations; variation in driver license programs; and a poor quality road network. Additionally, a lack of decent traffic-related data creates an obstacle for professionals and researchers to diagnose the problems scientifically and statistically and to make data-driven decisions.

#### 3.1. Data sources

Even with improved policies, guidelines, and roadway designs, understanding crash patterns and driver behaviors remain a challenge in preventing traffic crashes. This understanding cannot be achieved without a reliable database for traffic crashes. Non-governmental organizations (NGOs) and the Ministry of Health reports have cast doubt on the data reported by the traffic directorate and KRSO. They claimed that the fatalities in 2017 were more than 850 people and injuries were over 10,000 (Rudaw, 2017). Because of the lack of a unified computerized database for traffic crash inventory, different data from various sources are used. For example, the General Directorate of Traffic in Sulaymaniyah reported that the number of fatalities in 2015 and 2016 was 215 and 206, respectively, while the Forensic Medical Institute of Sulaymaniyah stated that the numbers are 222 and 242, respectively (Kamal, 2017). KRSO reported that the number of fatalities and injuries in 2016 were 685 and 8578 people, respectively, while Barzinjy (Barzinjy, 2017), from the General Directorate of Traffic Police Office of the KRI, states that the numbers were 800 fatalities and 11,000 injuries (Barzinjy, 2017; Kurdistan Region Statistics Office, 2017).

The collected data by traffic offices are based on the reports, which were written by traffic officers immediately after a crash occurred. These reports comprise information about victims, drivers, and vehicles characteristics, in addition to the crash locations and conditions. But, like many developing countries, the information that is provided by the police crash report is fairly basic compared to the United States and other developed countries because the crash report form itself is quite rudimentary. However, the police officers that respond to the crashes are traffic police with specialized knowledge of traffic issues. The lack of a health insurance system or coordination with victims and health centers to follow-up injured and involved people's health conditions complicated the process of recording their final statuses. Furthermore, the reported crashes include mostly those crashes that involved fatalities, injuries, and sometimes those with a high value of property damage. Because the region has no auto insurance policy system most Property Damage Only (PDO) crashes are resolved without being recorded. The lack of insurance record data excludes another possible source to check on the completeness and quality of the collected data. The data used in this study are the best dataset the authors have available to do this analysis recognizing may be incomplete in certain ways. These inconsistencies in the data reveal shortcomings in the process of the government in unifying these data in an inclusive database and considering traffic safety as a fundamental problem in the region.

#### 3.2. Demography of the region

An increasing number of drivers with convoys of forcibly displaced people could be one of the factors, where most of them are unfamiliar with the

region's traffic system, the Kurdish language, and local customs (Traffic Directorate of Garmian, 2012). Moreover, most of the drivers are not caught in police camera traps because the drivers and their vehicles are not registered in the region's database, which rescues them from fines. Suggestions to diminish the impacts of this factor could be registering those vehicles and drivers, provide them some instructive brochures and mandatory courses of the traffic system in the KRI.

Due to the stability of the KRI relative to its neighbors, the number of tourists in the KRI was about three million in 2013 (General Board of Tourism of Kurdistan, 2014). The unfamiliarity of these tourists, including the drivers, to the traffic rules and road conditions in the KRI, they are more likely to be involved in road crashes with serious consequences than the local population (Walker and Page, 2004). For instance, in Spain, the performance of international drivers was compared to domestic drivers using odds ratios (OR) (Claret et al., 2002). The results indicated that the OR for risk of causing a traffic crash of international drivers in comparison to Spanish drivers was significantly higher (1.55) in 95% CI (Claret et al., 2002). Correspondingly, Sivak and Schoettle (Sivak and Schoettle, 2010) found that there is a positive correlation between fatality rate per distance driven and drivers involved in fatal crashes who were out-of-state drivers in the US. Petridou et al. (1999) compared traffic injuries among international and domestic tourists in Greece and found that domestic tourists were involved in 15.9% of crashes, but international tourists were involved in 40.4% of crashes. Carey and Aitken (1996) found that the number of traffic-related injuries among international tourists in Bermuda was nearly six times higher than among domestic residents. In LMICs traffic crashes are a leading cause of death among foreign tourists (Stewart et al., 2016). There are no detailed data on involved tourists and visitors in traffic crashes in the KRI, but the data provided by the General Directorate of Traffic in Sulaymaniyah showed that the number of international traveler killed in traffic crashes in Sulaymaniyah was 5.83% in 2016 and 11.93% in 2017, respectively. Tourist and visitors to a new country or region get exposed to conditions that often are not familiar to them and this increases their probability of being involved in traffic crashes.

#### 3.3. Problematic guidelines, rules, and regulations

In Iraq generally and the KRI specifically, there are three major regulatory instruments related to the traffic sector, including traffic laws, Highway Design Manual, and General Specifications for Roads and Bridges.

##### 3.3.1. Traffic laws

When the Iraqi state was established in 1921 as a British protectorate, the Ministry of the Interior established the General Directorate of Police, and tasked them with duties such as organizing traffic, implementing driver licensing policy, vehicle registration, safety requirements, speed limits, fines and penalties for violators, and vehicle titles (Al-Tahafi, 2016). The first traffic code in Iraq was passed in 1932 (United Nations, 2007). This code was modified by several amendments and then replaced in 1971 (The Revolutionary Command Council, R. 1971. Traffic Law No. 48 of, 1971). One year after the downfall of Saddam Hussein's government in March 2003, the Iraqi Parliament under the Coalition Provisional Authority (CPA) legislated a new traffic code, which took effect in 2004. This code replaced all previous traffic laws. No studies have been published regarding the impacts of these law changes on changes in Iraqi traffic safety over time.

The current Iraqi traffic code contains 38 brief synopsis sections and an appendix with inadequate descriptions of traffic aspects and road components (Iraqi Parliament Council, 2004). For example, in the paragraph of the section entitled "Definitions," adult bicycles are defined as a type of vehicle and in the second section requires all drivers of vehicles to hold a driver license. In other words, biking without a driver license is illegal. Furthermore, in Section 22 of the code, the code described the imposed penalties for driving under the influence of alcohol and drugs, but the ratio of Blood Alcohol Concentration (BAC) that classify drivers as legally intoxicated was not mentioned. In 2018, the new amendment took effect (Iraqi Parliament Council, 2004) that corrected some of the distinct mistakes,

such as the definitions of traffic elements, but the law still needs considerable changes to keep it up-to-date with rapid technological developments and new research outcomes in the traffic sector.

For instance, nothing was mentioned regarding self-driving vehicles or four-wheel motorcycles, seat belts, child safety seats (booster seats), and airbags were not listed as safety devices. These devices secure and protect drivers and passengers from injury or death during vehicle crashes and disregarding them in the bill could have negative impacts on safety.

Regardless of the traffic law amendment passed by the Iraqi Parliament Council, the Kurdistan Parliament amended the law in 2018 (Iraqi Parliament Council, 2018). Although the previous law lacked all pertinent traffic conditions, the KRI amendment failed to address many shortcomings, and instead included only more strict regulations and raising the fine amounts of driving without a driver license, driving under the influence of drugs and alcohol, and driving recklessly (Kurdistan Parliament, 2018). Even though used and poor quality vehicles (Imad et al., 2014) have been entering the KRI since 1991, any mechanism for controlling the quality of imported vehicles is not mentioned in either traffic laws or their amendments. Lack of coordination between the Kurdistan Regional Government and the Iraqi federal government institutions have negative impacts on the traffic safety improvement processes in the country.

### 3.3.2. Highway design manual

One of the traffic-related guidelines that were published in Iraq was the Highway Design Manual of 1981, which unified all traffic-related standards; and those government agencies, industries, and professionals followed it for decades. The newest version of this manual is the Highway Geometric Design Code (HGDC) of 2015. The code mostly draws on three major sources: the American Association of State Highway and Transportation Officials' Policy on Geometric Design of Highways and Streets, the Transportation Research Board's (TRB) Highway Capacity Manual, and the Federal Highway Administration's (FHWA) Manual on Uniform Traffic Control Devices (MUTCD) (Ministry of Construction and Housing, and Ministry of Planning, 2015). Each one of these sources covers intensive detail of a specific branch of traffic engineering. The HGDC summarizes the major points of the sources concisely, but it does not cover many of the basic cases and situations, which violates the proposed goals of the code is providing a guidance and reference manual to assist highway designers with required specifics.

Even though the stated goal of the code is "to make the construction in Iraq excellent in specifications and conditioning concerning planning, execution, supervision, and application," (Ministry of Construction and Housing, and Ministry of Planning, 2015. Highway Geometric Design Code, n.d.) the code is inaccessible for policymakers, planners, engineers, researchers, and concerned government institutes and universities in both Iraq and the KRI. Due to a lack of decent banking and postal systems, to buy and receive a copy of the code requires a person to go to Baghdad physically and pay cash. There are no electronic versions of the code. Making the code out-of-reach represents a major gap, which hampers implementation and prevents unified standards from being developed. The standardization of guidelines of the traffic signs and the geometry of roads can have a positive impact on improving traffic safety and mobility.

### 3.3.3. General specifications for roads and bridges

Another important and formal guideline that each contract should follow in conjunction with conditions and drawing of contracts in Iraq, including the KRI, is the General Specifications for Roads and Bridges (GSRB). Like the HGDC, the GSRB is an inaccessible source for most interested parties. Its last revised edition was in 2007. One of the imperfections of this guideline is its inability to unify design guidelines in the country. The GSRB is in direct contradiction to the HGDC. For instance, the HGDC depends on the MUTCD for traffic signs while the GSRB depends on the Traffic Signs Regulations and General Directions (TSRGD) published by the Department for Transport of the UK and European Rules concerning road traffic, signs and signals agreed by the European conference of ministers of transport (Minister of Construction and Housing, 2007. General

Specification for Roads and Bridges. Minister of Construction and Housing, n.d.; Ministry of Construction and Housing, and Ministry of Planning, 2015. Highway Geometric Design Code, n.d.). The uniformity of standards and guidelines creates a unified road geometry and traffic control devices, and this provides consistency on the roads, which is important for driver attention, respect, and recognition and for a proper reaction while driving (FHWA, 2009). Another notable shortcoming is its dependency on outdated standards, manuals, and guidelines such as the British Standards (BS) of the 1960s and 1970s instead of the 2007 version for traffic sign specifications (Minister of Construction and Housing, 2007. General Specification for Roads and Bridges. Minister of Construction and Housing, n.d.). Most of the official guidelines and manuals in developed countries update continuously to include new instructions and engineering standards based on research, but this approach is missing in Iraq generally and the KRI specifically. For instance, neither HGDC nor GSRB have any guidelines or standard requirements for work zones.

### 3.4. Driver license programs

There is a lack of unified driver license programs (DLP) in the region. DLPs help learner drivers to build driving skills incrementally before they are exposed to more risky driving circumstances through sequenced phases (Baker et al., 2006). The first phase is a learner's period with supervised training and the next phase is an intermediate period which encompasses less hazardous and unsupervised driving circumstances, while the final stage is without the restrictions of the previous phases (Baker et al., 2006). DLPs in the KRI is limited to the first phase – learner's period with supervised training – only and split the four governorates into two remarkably different systems used in developed countries. The traffic offices in Erbil and Dahuk adopted the South Korean driver license system while Sulaymaniyah and Halabja adopted the Danish driver license system. The practice section of both adopted systems is carried out away from the real traffic environment, especially in Erbil and Dahuk, and in a controlled environment where no other traffic is around (Othman and Carroll, 2015). Furthermore, regarding the theory section, Othman and Carroll stated that 100%, 99%, and 88% of drivers could not read and understand "ONE WAY", "Yield", and "No entrance" traffic signs and 95% of them do not know how to use roundabouts (Othman and Carroll, 2015).

According to the Kurdistan Region Statistics Office (KRSO), in 2017, the number of newly licensed drivers in Erbil was 18,789 and this number is 6.1% higher in Sulaymaniyah (Kurdistan Region Statistics Office, 2017). The effectiveness of programs across the region in reducing the number or severity of crashes has not been assessed. This type of analysis will help decision-makers unify the DLPs in the KRI in favor of the appropriate approach. The Graduated Driving Licenses (GDL) programs, which are programs that allow teen drivers to safely gain driving experience before obtaining full driving privileges in the US, had a significant impact in reducing the number of crashes (Masten et al., 2011; McCart et al., 2010; Preusser and Tison, 2007) and this successful program could be adopted to institute an US-based graduate DLP in the KRI.

### 3.5. Road conditions and number of vehicles

Even with heavy investments in rebuilding, expansion, and maintaining of the road network over the past decade, most of the roads in the KRI were not built to modern operational and safety standards, and often are in poor condition because of insufficient safety measures. Furthermore, the number of newly registered vehicles has increased considerably, the total number of vehicles (of all types) between 2016 and 2017 in Erbil and Sulaymaniyah grew more than 6.6%, from 1,020,876 to 1,091,083 vehicles (Kurdistan Region Statistics Office, 2017). This ratio, for instance, was 3% in the US and five in Turkey (Hedges and Company, 2018; Turkish Statistical Institute, 2018). The number of newly registered vehicles in Sulaymaniyah in ten years (2003 – 2013) increased by about 160% while procedures to improve the quality of roads and maintenance plans have not kept pace. The vast majority of these vehicles are privately owned vehicles, which is



expected due to a lack of public transit or other alternative transportation modes.

Since early 2014, the economic crisis in the region has left negative effects on roads. The Kurdistan Regional Government stopped almost all road construction and maintenance projects. Consequently, the number of crashes increased, as shown in Table 1, especially at night and during adverse weather conditions. The number of fatal crashes increased by 83.8% while the number of non-fatal crashes increased by 2.7%. Since there is no auto insurance in the KRI, most PDO and single-vehicle crashes stay unreported, and there is no evidence that this trend changed during the study period. However, fatal and severe multi-vehicle crashes are usually reported because it is required by law and because repair and hospitalization expenses are involved. The number of fatalities increased dramatically by 71.7% and injuries by 150.4%, which means 11.4 increase in fatalities and 20.2% in injuries every year for a six-year period. These data show a pressing need for the KRI to start addressing this problem.

**4. Discussion**

Motor vehicle traffic crashes represent a leading cause of death in the KRI. At the country level, Erbil has the highest rate of road traffic injuries and fatalities and the rate is increasing dramatically, especially after a massive population movement to the KRI due to the armed conflicts in Syria and other parts of Iraq. Road traffic crashes create negative impacts on the safety and economic status of the population in the KRI. Lawmakers and police directorates conducted various legal proceedings through imposing stricter penalties such as increasing the magnitude of fines and stringency of legal sanctions in order to reduce the number of crashes, but the results were not promising in term of safety improvement.

Law enforcement should be only one component of any safety improvement plan, which comprises the 4Es (education, enforcement, engineering, and emergency medical services). The unfavorable results are indications that various factors have been ignored in the safety improvement process, including:

- Inadequacies in unifying traffic crash data in an inclusive and accessible database,
- Ineffectiveness or insufficiency of the traffic law and its enforcement to improve safety and reduce the number of crashes,
- Deficient and outdated road design standards to ensure constructing and operating roads according to safety criteria,
- Lack of a unified and comprehensive DLP in the KRI, and
- The unfamiliarity of the tourists and visitors to the KRI traffic policies and road conditions.

It is noteworthy to mention that the challenges considered in this article are common in post-conflict countries which are developing rapidly in the Middle East and globally. Therefore, the authors believe that the strategies and recommendations proposed in this article might be applicable in similar settings. Table 2 summaries strategies that will help address most of the current challenges. The need for more actions tailored to these challenges has never been greater. More collaborative interdisciplinary efforts, information sharing and establishing effective communication channels among involved authorities are needed. Based upon existing traffic-related

**Table 1**  
Traffic accidents in the KRI (Kurdistan Region Statistics Office, 2017).

Description	2011	2012	2016	Increase (%) <sup>a</sup>	CAGR (%) <sup>b</sup>
Crash	3715	3669	4040	8.7	1.7
Fatal crash	278	427	511	83.8	12.9
Non-fatal crash	3437	3242	3529	2.7	0.5
Fatality	399	576	685	71.7	11.4
Injury	3426	6080	8578	150.4	20.2

<sup>a</sup> The percentage of the difference between 2011 and 2016.

<sup>b</sup> CAGR is the Compound Annual Growth Rate which is used to measure and compare the past performance of traffic safety in the KRI.

situations in the KRI, the following are among the most fundamental and priority recommendations which must be taken:

- Provide funding resources in the region and province levels for a specific account, which earmarks funds to highway safety improvement projects and programs to reduce the number and severity of crashes.
- Improve Traffic Regulations and Guidelines – establishing unified and comprehensive policies and regulations that ensure safer roads for all users. Furthermore, creating requisite guidelines and upgrading the existing manuals and standards to keep pace with developments and provide better and safer roads.
- Create Traffic Crash Database – generating a precise and accessible database that includes inclusive information on traffic crashes that occur in the KRI and run by a specialized team. Such a database would allow researchers and other interested parties to assess present status, determine effective countermeasures, and evaluate traffic improvements from any conducted action.
- Start Traffic Training and Education – unifying and expanding the driver license program including all three consecutive phases of DLP (learning, intermediate, privilege). Moreover, engaging traffic education to the educational institution, media, and community organizations programs.

The preliminary proposed strategies and actions of the government and related parties are listed alphabetically in Table 2.

Additionally, the two present codes (HGDC and GSRB) as mentioned earlier, need to be updated because they do not fully cover basic and significant safety issues such as BAC and seatbelts. There are also various areas they did not address from which traffic safety can benefit. Therefore, many policies and/or guidelines are needed to improve traffic safety, such as:

- Commercial vehicles size and weight issues;
- Roadside safety (e.g., guardrails, ditches, clear zones, etc.);
- Planning, design, and operation of transit, bicycle, and pedestrian facilities;
- Manual on uniform traffic control devices (signs and signals);
- Stormwater, snow, and ice control;

**Table 2**  
Strategies and actions proposed by the authors to enhance traffic safety in the KRI.

No.	Strategies and actions
1	Amending traffic-related legislation to address risk factors such as speed, child restraints (booster seats), driving under the influence of drugs and alcohol, seatbelt-wearing and helmet-wearing to prevent injuries and fatalities rather than just generating revenues.
2	Conducting comprehensive studies through initiating and establishing multidisciplinary collaboration approaches for all involved authorities and agencies in the region.
3	Controlling the entry of poor quality new cars and used cars.
4	Designing and executing systematic research to understand the health and economic consequences of crashes.
5	Developing and implement integrated methods for surveillance, reporting and sharing information on crashes through robust coordination among relevant authorities, institutions, and community-based NGOs. Also, establishing reliable and adequate databases for traffic crashes to provide a full comprehension of traffic problems and evaluation of implemented changes and to determine the major associated factors and suitable methods to reduce the number and severity of crashes.
6	Establishing a strategic highway safety plan (SHSP) as a coordinated and informed approach to reducing traffic fatalities and severe injuries on all public roads in the region and establishing a system to monitor and evaluate the effectiveness of implemented procedures on the number and severity of crashes.
7	Establishing a central organization that is responsible, authorized, and accountable to coordinate efforts for traffic safety improvement.
8	Exploring opportunities for public-private partnerships to build modern/quality new highways and establish health insurance and car insurance.
9	Starting traffic and public health campaigns across the region using online platforms, mass media, and other outlets to increase awareness about traffic crashes and its consequences.
10	Updating and/or creating pertinent guides and manuals.

- Hazardous materials compliance; and
- Graduated Driving Licenses (GDL).

## 5. Conclusion

The KRI has witnessed relative stability, economic development and population growth in the last decade, especially compared to many surrounding regions. As in most of the fast-developing countries globally, many undesired consequences have emerged. Increasing traffic crashes and its negative outcomes are among the main unwanted consequences. It is crucial to address the challenges discussed in this paper to achieve needed traffic safety improvements in the KRI.

The major challenges facing traffic safety improvement include: problematic guidelines, rules, and regulations; lack of a precise and comprehend database; the existence of different driver license programs; poor quality road conditions; and a lack of alternative transportation modes such as transit in the KRI.

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