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Research Protocol

Epidemiology of Fatal Traffic Injuries Registered in East Azerbaijan and Fars Forensic Medicine Organizations: The Research Protocol

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Abstract

Purpose: Iran's statistics confirmed the number of road traffic injuries (RTIs) fatalities per 10,000 motor vehicles more than four times the global average. Accounting for the leading cause of death in people under the age of fifty, fatal road traffic injuries should be of a particular concern and a research priority in Iran. Assessing the epidemiological pattern of RTIs plays a critical role in the road traffic safety promotion.

Methods: The current paper aims to report a thorough research protocol on describing the methodology of a large research project on epidemiology of fatal traffic injuries in East Azerbaijan Province and Fars Province. The paper considers all fatalities due to road traffic crashes registered in forensic medicine organizations (FMOs), over a 13-year period between March 21st, 2004 and March 19th, 2016, divided into four time periods. It is grounded on the time span questionnaires including crash- and victim-related data such as type of crash, type of decedent's vehicle, counterpart vehicle, injured organs, final cause of death, place of death, role of decedent in crash, mode of transport, light condition, pedestrian's cloth color, date of crash, along with demographic data. The final analysis will be done using variables' common formats based on time periods questionnaires.

Conclusion: The research protocol could serve as a comprehensive resource to upcoming RTI studies based on FMOs data and could be of help for developing a domestic registry system. Considering the national structure of data collection in Iranian FMO, this protocol could even be referred at national level by studies conducted on FMO related data, regarding the methodology of research, categorizing questionnaires data, and rapid analysis.

Introduction

According to the World Health Organization (WHO), injuries as a most important suffering concern is among the three main causes of death in Eastern Mediterranean region (EMR), with 19.9 road traffic mortality rate versus 17.4 worldwide [1, 2]. The health and disease status has been transformed from communicable diseases to non-communicable ones and road traffic injury that caused 1.2 million years of healthy life-years lost in Iran [3] and accounted for the leading cause of death in people under the age of 50 [4]. Deaths caused by road traffic injuries (RTIs), should be of a particular concern in Iran, where only in 2007, about 27600 people, mostly the young and children, lost their lives prematurely and about 277000 were injured [5]. Furthermore, The death rate of 44 per 100,000) people stands the highest of any country in the globe for which reliable estimates are existing [6]. Fatal road traffic injuries should also be considered a research priority in EMR, particularly in Iran.

Fatality data are of higher impact on population health usually investigated for determining the priority interventions to reduce the burden of RTI. All road traffic injury fatalities over 30 days after crash are legally forced to be inspected on precise reasons for death via autopsy at the Forensic Medicine centers. Fatality data registered in forensic setting are known to have high standards of validity and reliability. In this report, we describe the methodology

of a large research project on epidemiology of fatal traffic injuries in East Azerbaijan Province, North-West of Iran and Fars Province, South of Iran.

The study population

All the fatalities due to road traffic crashes are directed to forensic medicine organizations in order to be inspected on the main causes of death via autopsy, between March 21st, 2006 and March 19th, 2016. Moreover, data related to the period from 2003 to 2005 will be analyzed in case of extraction from the archived database of the forensic medicine organizations.

Inclusion and exclusion criteria

All deaths caused by road traffic crashes/events happened in the provinces East Azerbaijan and Fars, from 2006 to 2016 are included in the current study. Thus other deaths due to air crashesand marine injuries are excluded from this study.

The study location

East Azerbaijan Province, one of the 31 provinces in Iran, is located in North-West of the country, with coverage of approximately 47,830 km², owns five percent of the whole population of the country, reached almost 3,725,000 people, according to the recent census in 2011. The province borders with three countries namely, Armenia, Republic of Azerbaijan, and Autonomous Republic of Nakhchivan, as well as three provinces of Iran; Ardabil, West Azerbaijan and Zanjan. There are twenty core districts in the province, to be precise, Aajabshir, Ahar, Azershahr, Bonab, Bostanabad, Charoymagh, Hashtrud, Heris, Jolfa, Kaleibar, Khodafarin, Malekan, Maragheh, Marand, Mianeh, Oskou, Sarab, Shabestar, Tabriz, Varzegan [7]. The capital of East Azerbaijan is its most populated city named Tabriz. It is the sixth crowded capital city of the country, with about 1,695,000 population [8, 9].

Fars province, one of the thirty one provinces of Iran, is located in the south of the country. It has an area of 122,400 km². In 2011, this province had a population of 4.6 million people, of which 67.6% were registered as urban dwellers, 32.1% villagers, and 0.3% nomad tribes. It neighbours Bushehr Province to the west, Hormozgān Province to the south, Kerman and Yazd provinces to the east, Isfahan province to the north and Kohgiluyeh and Boyer-Ahmad Province to the northwest. According to the latest divisions, the province contains the following counties: Abadeh, Sarvestan, Jahrom, Eqlid, Rostam, Estahban, Darab, Nayriz, Bavanat, Larestan, Qir and Karzin, Khorrambid, Lamerd, Kazerun, Fasa, Firuzabad, Zarrin Dasht, Mamasani, Shiraz, Marvdasht, Sepidan, Arsanjan, Pasargad, Kavar, Khonj, Farashband, Gerash, Kharameh, Mohr. The capital city of province, Shiraz is the sixth most populous city of country with about 1,470,000 population [10, 11].

Data collection tools and study variables

It is necessary to mention that the data collection tools has undergone some changes over a 13-year period from 2004. In detail, the questionnaire used through the first time periodbetween 2004 and 2006 contained just a few common questions about crash, and had wide and major differences from those of laterthree time spans. So we excluded it from the analysis. However, amendments through the next three time periods from 2006 to 2015 were mostly minor, in comparison. Therefore, the time span can be divided into four sequential terms as follows:

- Time period A: March 21st, 2004- March 20th, 2006 (Farvardin 1st, 1382-Esfand 29th, 1384)
  The used tool includes the following variables: crash place, injured organs, role of decedent in crash, final cause of death, place of death, education level, and sex.
- Time period B: March 21st, 2006-November 21st, 2009 (Farvardin 1st, 1385-Aban 30th, 1388)
  The collected data are based on the variables containing type of crash, type of decedent's vehicle, counterpart vehicle in crash with decedent pedestrian/decedent's vehicle, crash place, injured organs, final cause of death, place of death, role of decedent in crash, education level, and job.
- Time period C: November 22nd, 2009- March 20th, 2013 (Azar 1st, 1388- Esfand 29th, 1391)
  This tool includes the following variables: type of crash, type of decedent's vehicle, counterpart vehicle in crashes with decedent pedestrian/decedent's vehicle, crash place, injured organs, final cause of death, place of death, role of decedent at the time of crash, light condition, mode of transport, type of road, announcer of crash, clothing color, urbanity, education level, job, marital status.

Response format for various time periods	Response items
Type of crash	
Time period B*	Vehicle-vehicle Vehicle-pedestrian Rollover of vehicle Falling of vehicle Vehicle-fixed objects along the street/road
Time Period C** and D***	Vehicle-vehicle Vehicle-pedestrian Vehicle-fixed objects Vehicle-animal Rollover of vehicle Falling of vehicle Vehicle Fire Others Unknown
Common format	Vehicle-vehicle Vehicle-pedestrian Rollover of vehicle Falling of vehicle Vehicle-fixed objects along the street/road Vehicle-animal Vehicle Fire Others Unknown
Type of Decedent's Vehicle	
Time Period B	Pedestrian Car Minibus Autobus Pickup Truck, Trailer Motorcycle Ambulance Tractor Bicycle Others Unknown

(*Contd...*)

(*Continued....*)

Response format for various time periods	Response items
Time Period C	Pedestrian Car Minibus Autobus Pickup Camionet Truck Trailer Motorcycle Bicycle Ambulance Agricultural vehicle Hazardous materials tank truck Road construction vehicles Others Unknown
Time Period D	Pedestrian Car (including brand names: Peugeot405, Peugeot206, Pride, Peugeot Pars, Samand, Peykan, L90, Others, Unknown) Minibus Autobus (including brand names: Benz, Shahab, Volvo, Scania, Others, Unknown) Pickup (including brand names: Nissan, Peykan, Others, Unknown) Camionet Truck (including brand names: Benz, Volvo, Scania, Howo, Others, Unknown) Trailer (including brand names: Benz, Volvo, Scania, Howo, Others, Unknown) Motorcycle Bicycle Ambulance Agricultural vehicle Hazardous materials tank truck Road construction vehicles Military-Police vehicles Others Unknown
Common Format	Pedestrian Car Minibus Autobus Pickup Camionet, Truck, Trailer Motorcycle Bicycle Ambulance Agricultural vehicle Others Unknown
Counterpart Vehicle	
Time Period B	Car Minibus Autobus Pickup Truck, Trailer Motorcycle Ambulance Tractor Bicycle Others None Unknown

(*Contd...*)

(*Continued....*)

Response format for various time periods	Response items
Time Period C	Car Minibus Autobus Pickup Camionet Truck Trailer Motorcycle Bicycle Ambulance Agricultural vehicle Hazardous material tank trucks Road construction vehicles Others Unknown No Counterpart
Time Period D	Car (including brand names: Peugeot405, Peugeot206, Pride, Others, Unknown) Minibus Autobus Pickup (including brand names: Nissan, Peykan, Others, Unknown) Camionet Truck (including brand names: Benz, Volvo, Scania, Howo, Others, Unknown) Trailer (including brand names: Benz, Volvo, Scania, Howo, Others, Unknown) Motorcycle Bicycle Ambulance Agricultural vehicles Hazardous material tank trucks Road construction vehicles Military-Police vehicles Others Unknown No counterpart
Common format	Car Minibus Autobus Pickup Truck, Trailer Motorcycle Bicycle Ambulance Agricultural vehicle Others Unknown No counterpart
Crash place	
Time period A****	Inner city roads Outer city roads Rural roads Unknown
Time periods B&C	Inner city roads Outer city roads Others (rural roads and unpaved roads) Unknown
Time period D	Inner city roads (main street, side street, alley, highway, junction, square, circumferential highway, bridge, underpass, specific passages, boulevard, others, unknown) Outer city roads (freeway, highway, main road, side road, rural road, circumferential highway, specific passages, others, unknown)

(*Contd...*)

(*Continued....*)

Response format for various time periods	Response items
Common format	Inner city roads
	Outer city roads
	unknown
Injured Organs	
Time period A	Head
	Neck
	Chest
	Abdomen
	Upper Limbs
	Pelvis
	Lower Limbs
Time periods B, C&D	Head and Face
	Neck
	Chest and Abdomen
	Upper Limbs
	Vertebral Column
	Pelvis
	Lower Limbs
Common format	Head and Face
	Neck
	Chest and Abdomen
	Upper Limbs
	Vertebral Column
	Pelvis
	Lower Limbs
Final Cause of Death	
Time period A	Head trauma
	Bleeding
	Fracture
	Under examination
	Others
Time period B&C	Head trauma
	Bleeding
	Multiple fractures
	Burns
	Under examination
	Others
Time period D	Head Trauma
	Bleeding
	Multiple fractures
	Burns
	Asphyxia
	Others
Common format	Head Trauma
	Bleeding
	Multiple fractures
	Burns
	Asphyxia
	Mixed causes
	Others
	Not defined yet
Place of Death	
Time period A	Crash scene
	On the way to hospital
	Hospital
	Home
Time period B, C&D	Crash scene
	On the way to hospital
	Hospital
	Home
	Unknown

(*Contd...*)

(*Continued....*)

Response format for various time periods	Response items
Common format	Crash scene
	On the way to hospital
	Hospital
	Home
	Unknown
Role of Decedent in Crash	
Time period A	Driver
	Pedestrian
	Car passenger
	Motorcyclist
	Unknown
Time period B	Driver
	Pedestrian
	Car passenger
Time period C&D	Driver
	Pedestrian
	Car/pillion passenger
	Unknown
Common format	Driver
	Pedestrian
	Car passenger
	Unknown
Education level	
Time period A &B	Illiterate
	Primary school
	Guidance school
	High school
	Diploma
	University degree
	Unknown
Time period C&D	Illiterate
	Primary school
	Guidance \school
	High school
	Diploma
	University student
	Associate degree
	Bachelor degree
	Postgraduate education
	Unknown
Common format	Illiterate
	Nonacademic education
	Academic education
	Unknown
Light condition	
Time period C&D	Daylight
	Night
	Dawn/Dusk
	Unknown
Announcer of crash	
Time period C&D	Pasgah[a]
	Kalantari[b]
	Judicial authority
	Others
Marital status	
Time period C&D	Single
	Married
	Unknown
Job	

(*Contd...*)

(*Continued....*)

Response format for various time periods	Response items
Time period C	Student
	University student
	Housekeeper
	Employee
	Worker
	Self-employed
	Soldier
	Retired
	Unemployed
	Driver
	Farmer
	Others
	Unknown
Time period C&D	School student
	University student
	Housekeeper
	Employee
	Worker
	Self-employed
	Soldier
	Retired
	Unemployed
	Driver
	Farmer
	Military force
	Others
	Unknown
Common format	School student
	University student
	Housekeeper
	Employee
	Worker
	Self-employed
	Soldier
	Retired
	Unemployed
	Driver
	Farmer
	Military force
	Others
	Unknown
Nationality	
Time period D	Iranian
	Afghan
	Iraqi
	Pakistani
	Others
	Unknown
Mode of Transport	
Time period C	Ambulance
	Police vehicle
	Other vehicles
	Unknown
Time period D	Ambulance
	Police vehicle
	Passerby vehicle
	Others
	Unknown
Common format	Ambulance
	Police vehicle
	Passerby vehicle or other vehicles
	Unknown

(*Contd...*)

(*Continued....*)

Response format for various time periods	Response items
Pedestrian's Clothing Color	
Time period C&D	Dark
	Light
	Unknown

B*: March 21st, 2006- November 21st, 2009 (Farvardin 1st, 1385-Aban 30th, 1388), C**: November 22nd, 2009- March 20th, 2013 (Azar 1st, 1388- Esfand 29th, 1391), D***: March 21st, 2013- March 19th, 2016 (Farvardin 1st, 1392- Esfand 29th, 1394), A****: March 21o;//o; st, 2004- March 20th, 2006 (Farvardin 1st, 1382-Esfand 29th, 1384), a. Pasgah is an outer city police station under police organization to prevent crime.b. Kalantari prevents crime under police organization in a part of city

- Time period D: March 21st, 2013-March 19th, 2016 (Farvardin 1st, 1392- Esfand 29th, 1394)

  From 2013 to 2016, the used tool contains the following variables: type of crash, type of decedent's vehicle, counterpart vehicle in crashes with decedent pedestrian/decedent's vehicle, injured organs, final cause of death, place of death, exact place of crash, role of decedent in crash, announcer of crash, education level, light condition, marital status, job, nationality, mode of transport, pedestrian's cloth color (if the decedent is pedestrian), date of crash, death and living place, sex, age.

It is noticeable that although some similar variables are apparently measured in all four tools, their choices are mostly partially different. So we merged them, rationally combined their choices and finally issued a standardized tool.

Common Format Construction

Job: to make the common format, two items including soldier and military force are merged as one item.

Crash place: due to impracticality of merging the choices of crash place in all periods owing to their obvious differences, the categorization of common format is defined based on specific purposes as three items (inner city roads, outer city roads, unknown). Accordingly, the item of Outer city roads in time periods A, B, C is combined with the item of Others (rural roads and unpaved roads) in time spans of B, C, in order to construct the general item of outer city roads for the common format.

Final cause of death: over the time period D, the item of asphyxia was added to the choices. Due to lack of that in the previous periods, we eliminated it from the common format.

Education level: over the long period of time, the division of education levels particularly pre academic stage has undergone considerable changes and is categorized into various groups with different names, in the long run. Hence, all levels of primary, guidance, high school and diploma are merged and dubbed as the nonacademic level in the common format.

Vehicle Classification

In the current paper, the motor vehicles are defined based on the national traffic codes of Iran. Accordingly, vehicles are classified mostly based on capacity of total interior passengers and cargo volumes as follows:

Car: a motor vehicle for conveyance of maximum 6 persons designed to transport people only, including brands such as Peugeot405, Peugeot206, Pride, Peugeot Pars, Samand, Peykan, and L90.

Autobus: a motor vehicle for conveyance of at least 27 people including its driver, driver's assistant and passengers. The brand names considered by the forensic medicine organization data collection guidelines includeBenz, Shahab, Volvo, and Scania.

Minibus: a passenger vehicle with the capacity of 16 to 26 seats including its driver. No brands are listed for this category.

Motorcycle: a two or three wheeled motor vehicle with/without sidecar designed for human conveyance.

Cargo motor vehicles:

A wide range of motor vehicles for conveyance of commodities are categorized into three major groups by their payload capacity in tons, based upon the national traffic codes of Iran:

Truck: it is equipped with a bed which is continuously hinged at the rear. It has at least two axles with the cargo capacity of 6 tons or more. Examples of its brands includeBenz, Volvo, Scania, Howo. According to the national traffic codes, it is subdivided into different types such asflatbed truck, refrigeration truck, tank truck, truck with container,mixer truck, dump truck, camionet, semi-tractor truck cab, single cabin pickup truck, double cabin pickup truck, trailer, semitrailer.

Camionet: it is categorized into two types as follows:

- Van truck: a motor vehicle in which driver's cab and cargo part are placed separately on a chassis. Its gross vehicle weight rating is 3.5 tons to less than 5 tons.
- Lorry: its driver's cab and cargo part are located separately on a chassis. Its gross vehicle weight rating is limited from 5 tons to less than 6 tons.

Pickup truck: a motor vehicle that is designed in two distinct cabins for conveyance of both people (driver and other occupants) and freightby single-cabin pickup trucks, and exclusively cargo by double-cabin pickup truck. Its gross vehicle weight rating is less than 6 tons. Examples of the brands are Nissan, Peykan.

Trailer: a vehicle which is pulled by other motor vehicle. It includes the brand names Benz, Volvo, Scania, and Howo.

Semitrailer: it is attached to a vehicle by which its weight is partly carried.

Ethical Consideration

The joint project has been approved by the Traffic Injury Research Center, the Research Center of Iran's Forensic Medicine, as well as the East Azerbaijan and Fars Forensic Medicine Organizations. Its protocol has been approved by the regional ethical committees. Dr. Homayoun Sadeghi-Bazargani and Dr. Bahram Samadirad, as the principal investigators, fully own the copyright of the protocol for publishing data related to East Azerbaijan. Dr. Heidari and Dr. Gholamzadeh own the right for publishing Fars province data.

Forensic Medicine Process

The first step to be taken by a person with sustained injury caused by traffic accidents is to obtain a letter sealed and registered by judiciary or police force addressed to the forensic medicine examination department. Having completed the admission processes, the injured person is then examined by a physician of forensic medicine department, who then describes in writing the damages inflicted and physical defects incurred. Alternatively, a specialist and trusted physician is consulted on the extent and type of injuries. The information thus obtained is then mailed to the judiciary or the police force. Sometimes it is impossible to transfer the injured individual to the departments of forensic medicine. In such cases and depending on the types of injuries, the wounded person is hospitalized and through arrangements made with the department of forensic medicine, the examining physician of forensic medicine by calling on the hospitals concerned, would examine the patient on site and records the severity of injuries. However, if due to the types of injury further examination by the forensic medicine department becomes necessary, the forensic medicine physician would examine the wounded person in future sessions according to the timetables set by the forensic medicine department. Finally, the physical injuries inflicted and other damages incurred are documented and reported to the judiciary and the police force. Also there may be instances where the injured person either objects to the ruling of forensic medicine bureau or the examining physician becomes suspicious of some irregularities introduced by the injured person such as fictitious scene of accidents, or fake injuries. These entities will be discussed at specialized committees and decisions will be taken regarding the injured person and his or her type and severity of injuries.

Data Cleaning and Management

According to the above-described formats, all data will be extracted at district level from districts of East Azerbaijan and Fars. Following the data quality control, the data will be gathered at the statistics unit of forensic medicine organizations and entered into Access Database subsequently. Information of some randomly selected samples will be compared with data on archived records. At the stage of data cleaning, comparative and summarized analyses will be done in order to control data and make required amendments, if necessary.

Data analysis will be carried out using Stata 13 statistical software package (StataCorp, Texas) for classical statistical methods and SIMCA-P12.0 statistical software package (Umetrics, Umeå, Sweden) to perform supervised statistical modeling analysis.

Final note

The road traffic injury data are collected by a variety of organizations encompassing health systems over several steps, primary health care systems, emergency medical services, hospitals, red crescent organizations, forensic medicine organizations, as well as police using a form named KAM and through various methods like different surveys and research in Iran. Although there is often similarity between those collected data, actually the most reliable and comprehensive data belong to the forensic medicine organizations. Particularly, it owns death related part that provides

trustworthy and broad statistics on road traffic deaths. So, the forensic medicine organization database is considered as a data source in the current study. However, the road traffic injury registry system lacks an exclusive and comprehensive registry system in the country. Currently, it is planned to establish such a registry system by cooperation of the engaged organizations nationally. Also, systems of linkage improvement can be carried outon the various data gathered via different organizations.

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