A study on road traffic accidents in Arar, Saudi Arabia

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Background
Road traffic accidents (RTAs) are responsible for a substantial portion of morbidity and mortality and are responsible for more years of life lost than most human diseases.
Aim of the study
The aim of this study was to determine the type and contributing factors to RTAs in Arar, Northern Saudi Arabia.
Participants and methods
A cross-sectional study was carried out on randomly selected drivers in Arar city, Northern Saudi Arabia, KSA. Data were collected from 407 drivers aged between 18 and more than 55 years using predesigned questionnaires, which include questions designed to achieve the study objectives.
Results
RTAs were frequent with persons aged less than 20 years old, with a percentage of 36.9%, followed by 33.9% in the age between 20 and 35 years old and just 1.7% above 50 years. Distraction habits while driving were as follows: 49.6% use the cellphone while they drive and 30.5% smoke. Most of the RTAs happened during sunny weather (63.9%) and rainy weather (13.5%). The most frequent occurrences of RTAs were angle collision (40.8%), back collision (19.9%), and hitting a fixed object (13.3%). Place of accidents was main road in 43.2% followed by crossroad in 20.9 and 11.3% at traffic light site. Limbs, head, and upper body parts were the most injuries (35.1, 23.6, and 10.6%, respectively). After treatment, 3.4% of the injured drivers have distortion as a permanent disability, 2.9% have paralysis, and 2.5% have a limp. In all, 5.2% of the accidents resulted in one death, 2.5% resulted in two deaths, and 86% of the accidents did not result in any deaths.
Conclusion and recommendations
The findings of the present study will be helpful in the prevention of RTAs and its associated complications and hence will be vital for policymakers, health service managers, and stakeholders.

Keywords:
Arar, death, disability, distraction habits, driving, factors, Northern Saudi Arabia, road traffic accidents

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Introduction

Road traffic crashes (RTCs) are responsible for a substantial fraction of morbidity and mortality than most of the human diseases [1]. Road injuries occurred in almost 54 million people in 2013 [2]. This resulted in 1.4 million deaths globally in 2013, and up from 1.1 million deaths in 1990 [3]. Injuries resulting from RTCs are a major growing public health problem worldwide. RTIs are recognized as the most common cause of death, resulting in 1.26 million deaths each year globally, which accounts for 20.7% of all deaths from injuries [4]. Almost all high-income countries have decreased death rates, whereas the majority of low-income countries have increased death rates because of traffic accidents. Middle-income countries have the highest rate (with 20 deaths/100 000 inhabitants, 80% of all road fatalities by only 52% of all vehicles). While the death rate in Africa is the highest of all (24.1/100 000 inhabitants), the lowest rate is found in Europe (10.3/100 000 inhabitants) [5]. Many developing countries are still at low levels of motorization and the incidence of road traffic injuries (RTIs) in these countries is likely to increase. It is estimated that by 2020 road traffic accidents (RTAs) will be moved from

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ninth to third in the world disease burden ranking, as measured in disability-adjusted life years [6]. In addition, if present trends continue, road traffic injuries are predicted to be the third leading contributor to the global burden of disease and injury by 2020 [7].

A study conducted in Qatar [8] found that young drivers in the age group of 25–34 years had the highest prevalence of RTIs (35%). A significantly higher proportion of men had road traffic injuries when compared with women, with an incidence ratio of 1.4 : 1 (P=0.001), respectively. A large proportion of the injured drivers were involved in traffic violations within a year, especially violations such as exceeding speed limits (36.9%) and parking violations (18.1%). In all, 27.9% of injured drivers were distracted by eating or drinking, whereas 25.4% were distracted by using their mobile phone. The main types of crashes among drivers of Qatar were a result of overturn skid crashes (20.7%) followed by hitting fixed objects (15.1%). Those injured by both light vehicles and heavy vehicles reported the highest incidence of head injuries, with a combined percentage of 31.8% of all reported injuries.

Another study conducted in Northern Iran [9] showed that the prevalence of road traffic injuries in Guilan province was 31 in a population of 10 000. Of a total of 7671 accidents, 5976 (77.9%) were men and 1695 (22.1%) were women. Mean age of these victims was 33.3±17.289 years (32.64±16.939 for men and 35.62±18.312 for women). Most of them (32.5%) were 20–29 years old. Motorcycle–car accidents had the highest frequency followed by car–car crashes and car accidents involving pedestrians. Most of the patients (85.9%) were hospitalized and 280 (3.7%) injured died. Upper extremities were the most common sites of injuries. Male sex, length of hospital stay, multiple injuries, and increased age were associated with RTA-associated mortality.

Aim of the study

The aim of this study was to determine the type and contributing factors to RTAs in Arar, Northern Saudi Arabia, KSA.

Participants and methods

Study design and setting

This is a cross-sectional study carried out at five randomly selected Primary Health Care Centers in Arar city, Northern Saudi Arabia.

Study period and target population

The drivers were selected through systematic random sampling among patients registered for attending the Primary Health Care Centers during the study period. The study was conducted between 1 October 2016 and 30 April 2017, among drivers aged 18 years or above, who resided in Arar city. After obtaining informed consent, each participant was interviewed by a pretrained interviewer using a standard questionnaire. This questionnaire covered topics related to the sociodemographic, human behavioral factors of drivers, as well as environmental factors.

Sociodemographic information such as age, sex, and number of years that they have held a driving license, as well as type of vehicle driven, was obtained. Type of derived vehicle was light vehicles, which included the rest of the types of cars.

Sampling

The sample size was statistically calculated assuming a 50% prevalence of RTAs in Arar city, considering 5% bound on error of estimation and a 95% confidence level. The required minimum sample size for this study was 280. During the study period, 450 participants were approached, of whom 407 responded to the questionnaire, yielding a response rate of 90.4%.

Statistical analysis

Collected data were coded and analyzed using statistical package for social sciences (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics for the qualitative and quantitative variables were used. The χ^2-test was used as a test of significance, and differences were considered significant at a P value of 0.05 or less.

Ethical considerations

Participants were informed that participation is completely voluntary, and written consent was obtained from each participant before being subjected to the questionnaire and after discussing the objective with the participants. No names were recorded on the questionnaires. Adequate training of data collectors took place to ensure protection of confidentiality, and all questionnaires were kept safe.

Results

Table 1 illustrates the age group, nationality, history of chronic diseases, traffic violations within a year, and driving experience among the studied drivers. Saudi nationals constitute 89.7%. Regarding traffic violations within a year, 36.6% exceed the speed limit, 12.0% lost their driving license, 11.1% had stop or

yield violation, and only 5.4% had red light violation. Driving experience was more than 10 years in 59.2%, 5–10 years in 26.3%, and less than 5 years in only 14.5% of them. There were no chronic diseases in 65.4%, 16.7% were diabetics, and 8.4% were hypertensive. Table 2 illustrates age group, distraction habits while driving, weather at the time of accident, types of crashes, and place of accidents among studied drivers. Our study showed that RTAs were frequent with individuals aged less than 20 years old, with a percentage of 36.9%, followed by 33.9% in the age between 20 and 35 years old, and only 1.7% above 50 years. Regarding distraction habits during driving, our study found that 49.6% use the cellphone while they drive and 30.5% smoke. Most of the RTIs occurred during sunny weather (63.9%) and rainy weather (13.5%). The highest occurrences of RTC were angle collision (40.8%), back collision (19.9%), and hitting a fixed object (13.3%). Place of accidents was main road in 43.2% followed by crossroad in 20.9%, and 11.3% at a traffic light site. Table 3 illustrates the type and severity of injury, duration and type of treatment, presence of disability after treatment, and number of deaths due to studied accidents. In all, 51.6% of accidents were minor; limbs, head, and upper body parts were the most injuries (35.1, 23.6, and 10.6%, respectively). Duration of treatment was just 1 week in 46.9% of cases and the treatment was medical in 56.9% and surgical in 9.1%. As regards disability after treatment, 3.4% of the injured drivers suffered from distortion as a permanent disability, 2.9% suffered from paralysis, and 2.5% suffered from lame. Regarding deaths, 86% of the total crashes did not result in any deaths, whereas only 5.2% resulted in one death and 2.5% resulted in two deaths. Table 4 illustrates the relationship between age at the time of accident and traffic violations within a year, distraction habits while driving and type of crash among studied drivers (27.8% of the population aged <20 years, 40.6% aged 20–35 years, and 42.3% of the population aged 35–50 years exceeded the speed limit). In all, 61.4% of drivers aged less than 20 years use the mobile phone during driving, 57.1% of the drivers aged more than 50 years eat and/or drink, and 47.1% of drivers aged 35–50 years smoke during driving. Of drivers younger than 20 years, 39.9% had angle collision crash, whereas 19.0% of them had back collision, and only 11.4% of them hit a walking person. In addition, 39.1% of drivers aged 20–35 years had angle collision and 8.0% of them hit a walking person. There was a highly significant relationship between age group at the time of accident and distraction habits while driving ($P<0.000$).

Table 1 Age group, nationality, history of chronic diseases, traffic violations within a year, and driving experience among the studied drivers, Arar, 2016 (*n*=407)

	n (%)
Nationality	
Foreigner	42 (10.3)
Saudi	365 (89.7)
Traffic violations within a year	
No violation	103 (25.3)
Shading	39 (9.6)
Exceeding speed limit	149 (36.6)
Loss of driving license	49 (12.0)
Red light violation	22 (5.4)
Stop or yield violation	45 (11.1)
Driving experience (years)	
<5 years	59 (14.5)
5–10 years	107 (26.3)
>10 years	241 (59.2)
History of chronic diseases	
No	266 (65.4)
Bronchial asthma	9 (2.2)
Diabetes mellitus	68 (16.7)
Hypertension	34 (8.4)
Cardiac disease	30 (7.4)

Table 2 Age, distraction habits while driving, weather at the time of accident, types of crashes, and place of accidents among studied drivers, Arar, 2016 (*n*=407)

	n (%)
Age at the time of accident (years)	
<20	158 (38.9)
20–35	138 (33.9)
35–50	104 (25.6)
>50	7 (1.7)
Distraction habits while driving	
Use of mobile phone	202 (49.6)
Eating or drinking	81 (19.9)
Smoking	124 (30.5)
Weather at the time of accident	
Hot sunny	271 (66.6)
Foggy	28 (6.9)
Dusty	53 (13.0)
Rainy	55 (13.5)
Type of crash	
Hit a walking person	32 (7.9)
Hit a fixed object such as a parked vehicle	54 (13.3)
Car accident	34 (8.3)
Angle collision	166 (40.8)
Back collision	81 (19.9)
Collision head to head	40 (9.8)
Place of accidents	
Main road	176 (43.2)
Side road	70 (17.2)
Traffic light site	46 (11.3)
Roundabout	30 (7.4)
Crossroad	85 (20.9)

Table 3 Type and severity of injury, duration and type of treatment, presence of disability after treatment, and number of deaths due to studied accidents, Arar, 2016

	n (%)
Severity of injury	
Minor	210 (51.6)
Moderate	119 (29.2)
Sever	78 (19.2)
Type of injury	
Other sites	73 (17.9)
Limps	143 (35.1)
Abdomen	16 (3.9)
Head	96 (23.6)
Chest	43 (10.6)
Neck	36 (8.8)
Duration of treatment	
1 week	191 (46.9)
2 weeks	51 (12.5)
About 1 month	33 (8.1)
More than 1 month	60 (14.7)
No need	72 (17.7)
Type of treatment	
Surgical	37 (9.1)
Medical	232 (56.9)
Both	66 (16.2)
No need	72 (17.7)
Presence of disability after treatment	
No disability	345 (84.8)
Distortion	32 (7.8)
Limp paralysis	12 (2.9)
Lame	10 (2.5)
Limp loss	8 (2.0)
Number of deaths	
No deaths	368 (90.4)
One	21 (5.2)
Two	10 (2.5)
Three	4 (1.0)
Four or more	4 (1.0)

Discussion

Injuries are the main causes of mortality and morbidity in a majority of countries around the world [10,11]. RTIs are one of the leading causes of death, hospitalization, disability, and low socioeconomic status [12–15].

This is a cross-sectional study carried out in Arar city, Northern Saudi Arabia, KSA, throughout the period from 1 October 2016 to 30 April 2017 on random drivers using a predesigned questionnaire for data collection. The major purpose of this study is to determine the contributing factors to RTCs and RTIs in Arar, Northern Saudi Arabia KSA.

Our study revealed that RTAs were frequent among persons aged less than 20 years old, with a percentage of 36.9%, followed by 33.9% in the age between 20 and 35 years old. Another study [9] showed that the most and least traffic accidents belonged to the 20–29-year group and below 10-year group, respectively. Our results is supported by other studies in Mexico [16] and in Lazio, Italy [22]; they found that young people were the most common victims of road accidents [17–21].

Regarding driving experience, 59.2% had experience more than 10 years, which did not agree with another study [8] that found that RTC was more prevalent among drivers with 5 years of driving experience. However, this association is usually not apparent, and it invalidates the relationship between driving experience or age and crashes, resulting in the highest rate of crashes among very young and old drivers.

Regarding distraction habits while driving, our study found that 49.6% use the cellphone while they drive and 30.5% smoke. A study in Qatar [8] found that most (27.9%) of the injured drivers were distracted by eating or drinking while driving; this was followed by a large proportion of drivers (25.4%) who were using mobile phones (25.4%) or typing SMS/text messages (22.7%). Another study found that there was a 39% prevalence of distraction. The most prevalent distractions were due to interactions with another passenger and it was more prevalent among drivers below 30 years of age or older than or equal to 50 years of age [23]. Another study showed that distractions can have varying influences on crash type. More specifically, passenger-related and cellphone distractions are more likely in angular crashes, whereas for other electronic-device-related distractions the most probable type of crash is a single-vehicle crash [24].

A high percentage of those who were injured had committed traffic violations before; the main traffic violations included exceeding the speed limit (36.6%), parking violations (11.1%), and red light violations (5.4%). Another study [8] found that the main traffic violations included red light violations (13.4%), exceeding the speed limit (36.9%), and parking violations (18.1%). This is in agreement with the previous study [25], which has reported that an increase of 1 km/h in the mean traffic speed results in a 3% increase in the incidence of injury crashes and a 4–5% increase in fatal crashes.

The data presented in the current study revealed that most of the RTIs happened during sunny weather (63.9%) and rainy weather (13.5%). In fact, a study carried out in Saudi Arabia [26], which has a climate

Table 4 Relationship between age at the time of accident and traffic violations within a year, and distraction habits while driving among studied drivers, Arar, 2016

Variable	*n* (%)					*P* value
	Less than 20 (*n*=158)	20–35 (*n*=138)	35–50 (*n*=104)	More than 50 (*n*=7)	Total (*n*=407)	
Traffic violations within a year						
Shading	20 (12.7)	15 (10.9)	4 (3.8)	0 (0.0)	39 (9.6)	NA
Exceeding speed limit	44 (27.8)	56 (40.6)	44 (42.3)	5 (71.4)	149 (36.6)	
Loss of driving license	26 (16.5)	15 (10.9)	8 (7.7)	0 (0.0)	49 (12.0)	
Red light violation	7 (4.4)	11 (8.0)	4 (3.8)	0 (0.0)	22 (5.4)	
Stop or yield violation	8 (5.1)	11 (8.0)	24 (23.1)	2 (28.6)	45 (11.1)	
No violation	53 (33.5)	30 (21.7)	20 (19.2)	0 (0.0)	103 (25.3)	
Distraction habits while driving						
Use of mobile phone	97 (61.4)	77 (55.8)	26 (25.0)	2 (28.6)	202 (49.6)	0.000
Eating or drinking	22 (13.9)	26 (18.8)	29 (27.9)	4 (57.1)	81 (19.9)	
Smoking	39 (24.7)	35 (25.4)	49 (47.1)	1 (14.3)	124 (30.5)	
Type of crash						
Hit a walking person	18 (11.4)	11 (8.0)	3 (2.9)	0 (0)	32 (7.9)	NA
Hit a fixed object such as a parked vehicle	17 (10.8)	19 (13.8)	18 (17.3)	0 (0)	54 (13.3)	
Car accident	17 (10.8)	10 (7.2)	7 (6.7)	0 (0)	34 (8.3)	
Angle collision	63 (39.9)	54 (39.1)	46 (44.2)	3 (42.9)	166 (40.8)	
Back collision	30 (19.0)	28 (20.3)	20 (19.2)	3 (42.9)	81 (19.9)	
Collision head to head	13 (8.2)	16 (11.6)	10 (9.6)	1 (14.3)	4 (9.8)	

NA, not applicable.

similar to our study, also found that hot, sunny conditions increase RTI; this finding can be attributed to increased stress and decreased performance of tasks that require motor skills during hot weather. The study in Qatar [8] also agreed with these results; they found that most of the RTIs occurred during the hot climate (80.4%) and sunny days (87.5%), reflecting the unique climate and weather conditions of Qatar. This was not in agreement with findings of other studies that have reported increased incidences of RTIs and RTCs in rainy conditions particularly after long dry spells [26–28]. Another study found that the sequence of occurrence of crashes during different seasons from highest to lowest include sunny>rainy>foggy>snowy [29].

The most frequent occurrences of RTC were angle collision (40.8%), back collision (19.9%), and hitting a fixed object (13.3%). Another study [8] found that the highest occurrences of RTC were angle collision (21.2%) and overturn skid (20.7%) among the studied drivers. Meanwhile, the highest incidences of RTI were a result of overturn skid (18.6%) and hitting a fixed object (15.1%) among the drivers studied.

In our study, limbs, head, and upper body parts were the most common injuries (35.1, 23.6, and 10.6%, respectively). Another study [8] found that head, face, neck, and spine injuries were more common among RTCs and RTIs of heavy vehicle drivers and most of the injured drivers had been hospitalized for their injuries. However, in the study by Zahra and colleagues, the results showed that upper extremity injuries and upper body part injuries were the most important causes of hospitalizations, following head and neck and lower extremities. In men, 34.1% of injuries were in upper extremities, whereas in women head and neck were the most injured body organs (27.8%). In different ages, upper extremities and head and neck were the most injured parts, which were different from Belgium [30] and Shiraz study [17]. In Mexico [16], surface injuries had the highest frequency. In contrast, data from Riyadh and the Armed Forces Hospital Al-Aseer reported a lower number of all types, and particularly head and neck injuries during 2001–2006 [31].

Accidents are responsible for 10% of death in the world, even higher than that of AIDS, malaria, and tuberculosis [32]. In our study, 86% of the total crashes did not result in any deaths, whereas only 5.2% of the crashes resulted in 1 death and 2.5% resulted in two deaths. The Nigerian Federal Road Safety Corps estimated 3.7 deaths per 100 000 population for Nigeria in 2009 [33].

RTCs cause disability in the short and long term, they are the ninth leading cause in the world of disability-adjusted life years, and they generate 41.2 million years of healthy life lost, thus accounting for 2.7% of the total worldwide [31,34–36]. Our study estimated that 3.4% of the injured

drivers suffered from distortion as a permanent disability, 2.9% suffered from paralysis, and 2.5% suffered from lame. A study conducted in Spain showed that mobility disabilities were the most prevalent, vision disability 18.3%, and hearing disability 15.1% [29].

Conclusion and recommendations

The findings of the present study will be helpful in prevention of RTAs and its associated complications and hence will be vital for policymakers, health service managers, and stakeholders.

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Conflicts of interest

There are no conflicts of interest.

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