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ORIGINAL ARTICLE

Relations between Chronic Disease and Crashes within Professional Drivers

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ABSTRACT

Prevalence of chronic disease could be adversely having an effect on the capability of the driver. In addition, it must increase probability of accidents. The aim of this study was to examine the relationship between chronic medical conditions and contribution in crashes among drivers. In this cross-sectional study, the populations were professional truck drivers. The numbers of 323 people were selected to participate in the study. All of information for this survey was gathered by self-repot questionnaire. Analyses were performed by binary Logistic Regression, Cochran's and Mantel-Haenszel statistics and chi-square test. There was not a significant relationship between drivers who reported that they had heart disease and involved in crashes with divers without cardiovascular disorders involved in accidents. Drivers involved in crashes were further possible to have diabetes mellitus and respiratory disorders compared with drivers not involved in crashes. There was a significant relationship between vision complaint and driving accidents *(p*<0.05). The present study indicates that, several medical conditions were associated with the risk of crashes.

Keywords: *Chronic disease, Crash, Driver, Risk factor*

INTRODUCTION

One of the most important causes of fatal and nonfatal injuries in the world is Truck driver's trauma [1]. In addition, in Iran the large number of motor vehicle collisions is concerned with trucks [2]. The great segment of the truck driver population is chauffeur with chronic disease. Their rate of accident per mile of travel is increasing, and they are also more prone to be injured in a collision [3-5]. The increases in prevalence of chronic disease especially are an adjunct to aging could be adversely having an effect on the capability of the driver to safely operate a vehicle [6, 7]. Thus, recently there has been significant attention in clarifying the reasons causes the safety of drivers [7-9]. Unfortunately, there is not substantial concurrence about factors are related with reduced driving act. However, chronic medical conditions and medications may reduce the driver's skill to safely control a means of transportation [7, 10].

Too much of studies have recognized cardiovascular disease is related with vehicle crashes [11]. Several studies indicating that drivers with heart disease had higher hurtle proportion [12]. Research papers have shown that sick person with cardiovascular disease experience periodic electrocardiography monitoring increased abnormalities as driving [13]. Drivers with musculoskeletal disorders have been indicated the probability of collide; in addition, drivers with diabetic neuropathy had an increased risk of accident [14]. The use of medication for these diseases can produce dose related impairment on driver's performance. Benzodiazepines and antidepressants can affect on driving-related psychomotor skills, including reaction time, stimulus detection, hand-eye coordination, and simulated driving [15, 16].

There is limited and controversial information that put forward chronic medical conditions and medications such as psychoactive drugs influence on driving performance or on risk of involvement in accidents [17]. To recognize this, we carried out a cross sectional study among a defined population of licensed drivers. The

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Table 1. Demographic and driving characteristics of drivers involved in crashes and drivers not involved in crashes (N=323)

Age % (n)	<30 years	40 (12.4)
	31-40 years	91 (28.2)
	41-50 years	124(38.4)
	>50 years	68(21.1)
Duration of employment % (n)	< 5 years	30 (9.3)
	6-15 years	120 (37.2)
	16-25 years	130 (40.2)
	> 25 years	43 (13.3)
Educational attainment % (n)	Elementary	142 (44)
	Guidance school	89 (27.6)
	High school or higher	92 (28.4)
Smoking % (n)	Smoker	157 (48.6)
	Non smoker	166 (51.4)
Weekly distance of driving % (n)	< 2000 Km	71(22)
	2000 – 4000 Km	191(59.1)
	> 4000 Km	61 (18.9)
BMI Mean (SD)		26.5 (3.4)

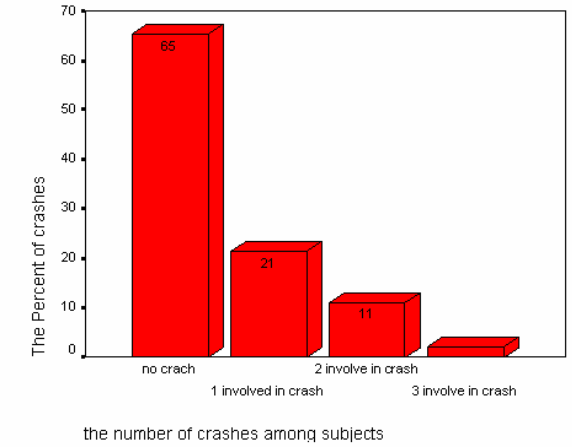

Fig 1. The distribution of accidents among study population

objective of this survey was to assessment the relationship between chronic medical conditions and contribution in crashes among drivers after attention to demographic factors and driving exposure.

MATERIALS AND METHODS

This was a cross-sectional study and the population included all truck drivers who acquired a driver license. The study subjects were 65-84 years old who made approaches in Occupational Medicine Clinic at some time throughout the study period for medical examination and responded to a two-page questionnaire in 2008-2009. A random sample of population was chosen in regard had a valid driver's license and met several other admission criteria considered to eliminate persons. Finally 323 people were selected to participate in the study. All of participants were men and did not differ in age, driving precedence and so on. Distinction in race could not be assessed. Also we obtained informed consent from all of study population.

All of information for this survey was gathered by self-repot questionnaire. Interviews were conducted between September and February 2008-2009 by trained interviewers who were blind to objectives of the study. A two page questionnaire including standard demographic information (age, gender, marital status, work precedence and education), as well as information on chronic medical conditions, driving habits, visual function, and expose to accident were complete for all of participants.

In epidemiologic studies among different diseases, the validity of self-report questionnaire may vary. For carcinomas almost high conformity observed between self-report and pathology records. Application of diagnostic criteria to cardiovascular disease and stroke showed the need for care in the use of self reported diagnoses for these outcomes [18]. However self report questionnaire is an applicable apparatus with partially good validity for diagnostic chronic disease. Subjects were also asked whether they had been diagnosed any other conditions not stated. This study had been done among drivers who referred to Medical Clinic to receive health driving certification, and physician had to examine them. For increasing the validity of population's responses to self report questionnaire, we also compared their responses with physician finding and revised inconsistency between them.

We also gathered information about preceding accident involvement (2005–2008), estimated weekly kilometer, and type of vehicle most commonly driven. Visual function was assessed by using a Snell Chart. The Snell Chart presents subjects with deficiency in vision.

Frequency distributions were computed for demographic, driving, and chronic medical conditions for subjects with and without accidents. For chronic medical conditions in relation for accidents, demographic factors and weekly distance of driving, analyses were performed by binary Logistic Regression, Cochran's and Mantel-Haenszel statistics and chi-square test.

RESULTS

Table 1 shows the demographic and driving characteristics of study population. Approximately 66% of study group had placed in the middle of their age. Also more than 90% of subjects are driving over 5 years. All of drivers were men and their professional was driving. The mean of weekly distance was traveled by drivers was 3249 km with 1208.3 standard of deviation. All subsequent analyses are kilometer adjusted.

Fig. 1 indicates the frequency of accidents among the study population. Drivers had been involved in a crash in the previous 3 years is illustrated in this figure. Less than 3% of drivers had involved in crashes for 3 times in past 3 years. And nearly 35% of study group was involved in accident.

Table 2 presents the prevalence of chronic medical conditions among all of drivers. Several states including

Table 2: Medical characteristics of all study population

Disease Type	Frequency Distribution (N=323)
Heart Disease n (%)	43 (13.3)
Diabetes Mellitus n (%)	85 (26.3)
Respiratory Disorders n (%)	23 (7.1)
High Blood Pressure n (%)	58 (18)
Vision Disorders n (%)	83 (25.7)

retina, memory problems, epilepsy, convulsion and Parkinson's disease do not exist because their prevalence was too low to acquire significant assessment. As shown, diabetes mellitus (26%) and vision disorders (25%) had more prevalence than another. The least occurrence was for respiratory disorders that was 7.1%.

The rate of drivers who reported that they had heart disease and involved in crashes was 23% while 36.4% of divers without cardiovascular disorders involved in accidents, but there was not a significant relationship between them. However, the risk for heart disease and accident in this population was OR=0.5 with 95% CI: 0.25, 1.1. Drivers involved in crashes were further possible to have diabetes mellitus compared with drivers not involved in crashes. 49.4% of diabetics and 29.4% of no diabetes involved in accidents and there is a significant relationship between diabetes and driving accidents (p<0.001). Also the odds ratio for diabetes in relation to accident was (OR=2.3, 95% CI: 1.4, 3.8). 44.6% of vision disorders and 31.3% with no problem in their eyesight involved in accidents and there is a significant relationship between vision complaint and driving accidents (p<0.05). The risk estimate for vision disorders in regard to accident was (OR=1.7, 95% CI: 1.06, 2.9).The increased risk was apparent among respiratory disorders (OR=1.4, 95% CI: 0.6, 3.5). But no significant relationship observed among respiratory disorders and accident. There was no statistical relationship between prevalence of high blood pressure and accident.

We used binary Logistic Regression model to obtain the simultaneous effect of variables on crashes. Table 3 showed the result of this method. As revealed, duration of employment, heart disease, diabetes mellitus and vision disorders are variables that have a certain effect on accident. Thus, we used Cochran's and Mantel-Haenszel (CMH) statistics to take into account relation between affecting chronic disease in Logistic Regression model and crashes in regard to duration of employment (Table 4). Chi-Square Test showed in population with less than 17 year duration of employment and more than 17 year duration of employment, there was no statistical association between heart disease and crashes. In addition, CMH test indicated that the risk estimate of two groups is the same (P=0.56). Diabetes Mellitus had a statistical relationship with crashes in two groups of the duration of employment with Chi-Square test. The Homogeneity of the Odds Ratio in two groups with CMH test did not reject (0.27). Therefore common odds ratio by means of CMH method in diabetes was OR=2, 95% CI: 1.19, 3.37.

Table 3. Variables affected on accident according to binary logistic regression model

Variable	B	S.E	P-value
Age	-0.001	0.027	NS
Education	0.063	0.174	NS
Marriage	-0.516	1.153	NS
Smoking	7.007	15.09	NS
Duration Of Employment	0.065	0.029	0.024
Heart Disease	0.866	0.426	0.042
Diabetes Mellitus	-0.635	0.287	0.027
Respiratory Disorders	-0.336	0.485	NS
High Blood Pressure	0.135	0.35	NS
Vision Disorders	-0.596	0.291	0.07
Vehicle Type	-0.596	0.189	NS
Weekly Distance of Driving	0.0001	0.0001	NS
BMI	0.0001	0.038	NS

For vision disorders did not observed a significant relationship with crashes in two groups with Chi-Square test. The Homogeneity of the Odds Ratio in this population with CMH test did not reject (0.69). Therefore common odds ratio by means of CMH method in diabetes was OR=1.63, 95% CI: 0.97, 2.76.

DISCUSSION

Our results showed that drivers with diabetes and vision disorders had about twice risk for accident associated to drivers without this disease. Also we observed that respiratory disorders may increase the risk

Table 4. Relationship between medical condition and accidents in regard to duration of employment (N=323)

Duration of employment	<17 year			>17 year		
Accident / Disease Type	Involved in accident	Not Involved in accident	p-value	Involved in accident	Not Involved in accident	p-value
Heart Disease n (%)	1(2.5)	12(9.8)		9(12.5)	21(23.9)	
No Heart Disease n (%)	39(97.5)	111(90.2)	NS	63(87.5)	67(76.1)	NS
Odds ratio	OR:0.237 CI: 0.03, 1.88			OR: 0.456 CI: 0.194, 1.07		
Diabetes Mellitus n (%)	13(32.5)	17(13.8)		29(40.3)	17(13.8)	
No Diabetes Mellitus n (%)	27(67.5)	106(86.2)	0.017	27(67.5)	106(86.2)	NS
Odds ratio	OR:3 CI: 1.3, 6.9			OR:1.6 CI: 0.83, 3.1		
Vision Disorders n (%)	12(30)	23(18.7)		25(34.7)	23(26.1)	
No Vision Disorders n (%)	28(70)	100(81.3)	NS	47(65.3)	65(73.9)	NS
Odds ratio	OR:1.86 CI: 0.826, 4.2			OR:1.5 CI: 0.762, 2.96		

of accident but there wasn't statistical relationship. Reports of investigations about the role played by chronic disease in crashes are low. In different literature the need for such investigation has been concerned [19]. The literature on the relation between chronic disease and accidents is extensive, the incidence of accidents related to chronic medical conditions would not appear to be high [20]. Surveys into the relation between medical condition and accidents have created conflicting results. A study was conducted in California, showed that drivers with diabetes, epilepsy, cardiovascular disease, alcoholism, and mental disorders had indicated more accidents than their control [21]. But another research in Sweden, observed that drivers with diabetes, cardiovascular disease, renal disorders, epilepsy, and diseases of the sense organs had nearly half the number of crashes compared with the control group [22]. The findings of these analyses were that drivers who reported heart disease were less likely to be involved in automobile crashes, but these associations come into view to be no significant relationship. Some of studies have confirmed heart disease isn't associated with accident [14, 23]. Several studies have reported that drivers with heart disease shoed higher crashes [21, 12]. All of these researches did not collect information on the confounding factors that may confuse crash risk. In our studies, probably patients with heart disease may spend less time and therefore less kilometer driving [24]. For that, the risk of accident in heat disease is lower than another. Also, there may be other confounding factors such as lack of sufficient sample in this study. Thus, we suggested that future research should be focused specially on heart disease, with concerning all of confounding factors such as: annual mileage, diet and etc to resolve the nature of the relation between heart disease and accident. Our results also indicated that drivers who reported diabetes were more likely to have been involved in an automobile crash. Laberge at all has stated a higher accident rate in diabetic patients [26]. Another study demonstrated a significant excess of accidents in diabetic men age less than 55 years [27]. Around 72,000 diabetics were investigated in Germany; only 0.09% of the diabetic drivers had been involved in road accidents [28]. Another research was taken during a five-year observation period on 28 diabetics in the occupational situation indicated that five of these were involved in road accidents [27]. In assessing the results of literature, we must to bear in mind that some studies didn't have control groups or didn't perform conforming to the investigation groups in regard to sex, age, driving experience, and distance of driving. For this reason, there are contradicting results in various studies. However, it seems diabetes can be affected on prevalence of accidents but also more information is needed. We observed that drivers who reported vision disorders were involved in accident more than drivers with healthy eyes. In literature was found that Disturbances of vision are sometimes taken into account as being a cause of road accidents. Smeed indicated high frequency of visual disturbances in drivers involved in accidents [29]. Approximately one third of all fatal road accidents are due to vision disorders [28]. In another survey, there was no statistical relation in visual disturbances in the drivers and accident [28]. Future research focused specifically on those with vision disorders is necessary to show the relation between vision disorders and crash risk.

In this study, we used a self-report questionnaire to identify the prevalence of chronic disease in population. Public health researchers are discussed about the validity of self-reported information [28]. Bacon stated that agreement is high between the self-report and medical record report of common medical conditions [29].

There are several limitations to this study. First, we used a self-reported questionnaire for accidents and this may be having bias due to error in reporting their accident. Also participants who involved in more than one accident during 3 past years didn't concern in this study. Future research should be done with regard to a control group and take into account confounding factors specially during of employment and precedence of accident.

The present study indicates that, several medical conditions were associated with the risk of crash. But the restrictions seem to be effective factors in our results. Also it seems to chronic medical factors which may have contributed to accidents.

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