



Screening out accident-prone Iranian drivers: Are their at-fault accidents related to driving behavior?



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ABSTRACT

To provide a scientific background in road safety domain a better understanding of human risk factor is crucial. The aims of the present study were the following: (1) developing an accident prediction model for estimating the at-fault accidents of drivers (2) controlling for the regression-to-the-mean and screening out the accident-prone drivers (3) identification of significant behavioral predictors in at-fault accident occurrences and delving into the relationship between the aberrant driving behaviors and at-fault accidents of those identified as accident-prone. A questionnaire survey compiling various measures of personality type, aberrant driving behavior, demographic and accident history information of 1762 Iranian drivers was conducted in which 1375 male and 387 female participants were of the average age of 35.6 (S.D. = 11.987). To analyze the obtained data, the generalized linear modeling (GLM) approach was taken resulting in four models with various independent variables. The results indicated that age, gender, education level, years of active driving, and especially exposure had an effect on drivers' at-fault accidents while there was no discernible effect from income level, personality type and area of residence. In the screening procedure, 715 drivers were identified as accident-prone. Behavioral comparison analyses indicated that the lapses, errors, ordinary and aggressive violations are different for the accident-prone drivers. A comparison between the accident-prone and non-accident-prone drivers revealed that the ordinary violations have considerably higher effect than the others on at-fault accidents. Implications of the results are discussed with regard to insurance policies and education interventions.

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1. Introduction

In Iran, the road traffic deaths per 100,000 population (fatality rate) in road traffic casualties (RTCs) has declined from 38 per 100,000 population in 2004 to 31 in 2011 (Ayati, 2009; Bahadorimonfared et al., 2013). However, during that time, the death rate in RTCs has been on increase from 51 cases per 1000 accidents to 65 (Bahadorimonfared et al., 2013). Despite

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minor decline in fatality rate in RTCs in Iran, it is still higher than the worldwide rate of 17.4 per 100,000 (World Health Organization, 2015). In Iran the burden of traffic injuries in terms of disabled-adjusted life years (DALYs) was over 1,300,000 years lost in year 2005 (Naghavi et al., 2009). The economic cost of traffic accidents was estimated 6% of Gross National Product in year 2013 (World Health Organization, 2015), whereas, car and motorcycle industry accounts for 4% of Iran's Gross Domestic Products (GDP) (Naghavi et al., 2009). Thus, RTCs are a serious public health problem and it is necessary to place greater emphasis on improving the prediction of accident involvement in Iran.

Some drivers are more likely to experience RTCs. Demographic factors influencing RTCs are being male, young, novice driver, and having higher exposure rate, and lower socioeconomic status (World Health Organization, 2015). WHO (2004) reported that males are nearly 3 times more likely to suffer RTCs as compared to females in Iran, it is nearly 4 times more likely (Bahadorimonfared et al., 2013; Rasouli, Nouri, Zarei, Saadat, & Rahimi-Movaghar, 2008). Regarding experience, young novice drivers in the second and third decades of their life represented the majority of RTCs, worldwide (Lourens, Vissers, & Jessurun, 1999; Mohammadi, 2009; Rajalin, 1994; Roudsari, Sharzei, & Zargar, 2004; Shope, 2006; Tseng, 2012). Several studies explored the interaction of age and gender in RTCs. For example, in Britain, men at 16–24 years of age were at the most risk, while women over 75 years old were at the greatest risk. There was an increase of 21% between 25 and 59 years of age for women while there was no corresponding increase for men (Holland & Hill, 2007). Iran police records show that males within the age group of 26–33 have more involvement in accidents whereas females within the same age group have a lower percentage of accidents (Mohammadi, 2009). Considering that, however, study of Zhang, Yau, and Chen (2013) in China indicated that driving experience takes over the effect of driver's age for accident severity, pointing to the importance of driving skills. With respect to education, there have been some evidence suggesting that drivers with lower level of education and low status occupations have a higher chance of being involved in traffic accidents even when the rate of exposure are accounted for (World Health Organization, 2015). However, the level of education has had little impact on accident involvement among Dutch and Taiwanese drivers (Lourens et al., 1999; Tseng, 2012), though for the drivers in China it had (Zhang et al., 2013). A study in Iran shows that RTCs are more common among women and men with low level of education and socio-economic status. The risk of RTCs among illiterates is 1.8 times more than that of people with higher education (college) in the adjusted model (Sehat, Holakouie Naieni, Asadi-Lari, Rahimi Foroushani, & Malek-Afzali, 2011). A cluster analysis study in Iran indicates that drivers with intermediate education are less risky compared with those of lower and higher education level throughout the age groups (Mohammadzadeh Moghaddam & Ayati, 2014).

Personality constitutes relatively enduring characteristics, revealing a particular pattern of behavior which may predispose individuals to commit risky driving and in accident involvement. A range of studies have directly associated certain personality traits to accident involvement or risky driving behaviors which in turn lead to accidents. For example, a study in Iran and Turkey pointed out that personality traits of sensation seeking and normlessness are among significant predictors of risky driving behavior (Nordfjærn et al., 2014). Examining personality types super-ordinations of specific associated traits revealed the contribution of Type-A behavior pattern to a person's likelihood of engaging in risky driving behaviors (West, Elander, & French, 1993). People with Type-A personality pattern tend to be competitive, hostile, aggressive and impatient (Friedman & Rosenman, 1974). Miles and Johnson (2003) found that respondents in the violators sample compared to control group did report significantly higher Type-A behavior pattern. People classified in Type-A behavior pattern are more likely to get stressed-out and exhibit aggressive driving behavior (Galovski & Blanchard, 2004). However, Type-A personality was not a direct factor in the accident involvements in West et al. (1993)'s study. In Iran, Type-A personality has shown meaningful effect on driving violations, accidents and fines. In fact, younger Type-A and B men and also younger Type-A women with lower level of education have been the riskiest groups (Mohammadzadeh Moghaddam & Ayati, 2014).

Studies have demonstrated the tendency of accident-involved drivers to high risk behaviors or unsafe road practices (Chen et al., 2009; Chliaoutakis et al., 2002; Lajunen, Parker, & Summala, 2004; Reason, Manstead, Stradling, Baxter, & Campbell, 1990; Sümer, 2003). Drivers prominently fined for committing driving violations were more often involved in traffic accidents; and the relationship between violation and accidents were independent of exposure rate (Lourens et al., 1999; Stamatiadis, Agent, Pigman, & Ridgeway, 1999). Moreover, self-reported aberrant driving behaviors have also been proved to be related to accident involvement and severity (Iversen & Rundmo, 2002; Kim, Nitz, Richardson, & Li, 1995; Parker, West, Stradling, & Manstead, 1995; Reason et al., 1990). Kim et al. (1995) used police officers' database and showed that driver behavior particularly alcohol or drug use and not using seat belt had the greatest impact on severity of accidents. A framework to study aberrant driving behavior has classified errors and violations (Parker et al., 1995; Reason et al., 1990). Errors are regarded as unwanted results of involuntary actions while violations are due to the conscious deviation from a rule or safe practice. Errors were additionally classified into slips and lapses (resulting from action) and mistakes (errors of intention) (Chliaoutakis et al., 2002; Lajunen et al., 2004; Parker et al., 1995). Also, violations were further divided into aggressive (i.e., showing hostility) and ordinary (deliberate breaking of traffic rules). The contribution of this taxonomy of aberrant driving behavior in explaining accident involvement has been well established in different countries (Reason et al., 1990; Warner, Özkan, Lajunen, & Tzamalouka, 2011). Also, the taxonomy shows some demographic discrepancies. Violations are consistently reported with higher frequency by male drivers, by younger drivers, and by high-mileage drivers. Young novice drivers (18–20) and especially young male drivers showed more violating driving rules than middle-aged novice drivers (31–50) (Laapotti, Keskinen, Hatakka, & Katila, 2001). Ordinary and aggressive violations are more prevalent in younger males, whereas, females and older novice drivers report more errors and slips (Rowe, Roman, McKenna, Barker, & Poulter, 2015). Driving violations are recognized to be a stronger factor related to accident involvement (Chliaoutakis et al., 2002).

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