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Traffic Accidents and Health of the Driver

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Abstract

Background: Most traffic accidents occur as a result of human factors. The drivers' physical health is one aspect of the human factors. In order to assess the drivers' health status, valid screening tools are needed.
Objectives: The purpose of this study was to translate the Driver Medical Questionnaire (DMQ) into Persian and evaluate its psychometric properties.
Patients and Methods: This was a descriptive/methodological study. The DMQ was translated from English into Persian by using the standard forward-backward translation technique. The face validity of the questionnaire was assessed using the comments of several drivers and military doctors. The reliability of the questionnaire was evaluated for internal consistency analysis using the Kuder-Richardson 21 formula as well as test-retest reliability assessment using the intraclass correlation coefficient calculation techniques. A total of 45 traffic offenders were invited to complete the pilot version of the Persian DMQ twice with a 14-day interval. Finally, the health status of 360 traffic offenders was evaluated by using the final version of the Persian DMQ.
Results: The questionnaire yielded a Kuder-Richardson 21 value of 0.68, while the intraclass correlation coefficient was 0.94. Approximately half (51.1%) of the participants had no health problem, 38.1% had 1 health problem, and 10.8% had 2 or more health problems. The latter group needed referrals to occupational medicine specialists. The Drivers' health status was significantly associated with a history of accidents in the past 3 years (P = 0.01) and a history of injury-associated accidents (P = 0.001).
Conclusions: The Persian version of the Driver Medical Questionnaire (PDMQ) can be used as a valid and reliable tool for the screening of drivers' health problems. Primary prevention and health promotion could have an important role in injury prevention and reduce the rate of traffic accidents.

Keywords: Driver Medical Questionnaire, Drivers, Traffic Accidents, Psychometric Evaluation

1. Background

Globally, traffic accidents are major health problems. Each year, between 20 and 50 million people are injured in accidents around the world, with 1.2 million deaths as a result of these injuries. Road traffic injuries are the number one cause of deaths among those aged 15 - 29, who are the most effective population in a society's financial development (1). Studies have predicted that between the year 2000 and 2020, the number of accident victims will decreases in developed countries and increases in low as well as middle-income countries. Consequently, it is estimated that traffic accidents, which are currently the 11 leading cause of deaths and injury will became the 3rd leading cause of death and injury by 2020 (2). Recently, there has been a rapid increase in motor vehicle use in many parts of the world, making transport-related injuries (TRIs) the dominant mechanism of trauma in most parts of the world (3). TRIs are a major public health problem worldwide (4). The global rank of our country, Iran, for accident-related mortality rate, is 8, while its rank in the Eastern Mediterranean Region is 2, second only to Libya. The rate of traffic accidents in Iran is 15 times higher than in developed countries (5) and hence, such accidents are a major health problem in Iran (6).

It has been estimated that 90% - 95% of all traffic accidents are caused by human factors.Human factors include physical, psychological, social, and cultural factors (7, 8). Physical factors significantly affect drivers' performance and the risk of accidents (9, 10). Some physical factors and illnesses, which contribute to the incidence and the severity of traffic accidents include older (over 55) or younger

(under 20) ages (11-13), medications (12), fatigue and sleepiness (14), obesity (15), as well as chronic conditions such as sleep apnea (16) and depression (17). On the other hand, considerable stress and immobility also predispose drivers to develop diabetes mellitus (18, 19) and cardiovascular disease, which can accelerate their mortality rate and affect the incidence of traffic accidents (20). Additionally, addictive substances, alcoholic drinks, and medications have been known to affect drivers' performance and the rate of traffic accidents (21). Major physical health problems can also affect the drivers' cognitive function. Consequently, drivers need to be physically, mentally, and psychologically competent (22).

One of the key prerequisites to the effective management of drivers' health problems is to assess and identify the problems through adopting screening procedures. According to Leproust et al. (2008), screening can help readily identify many physical health problems among drivers (3). One component of successful screening is the use of valid screening tools (23). Currently, the screening procedures for assessing the health status of drivers license applicants in Iran are performed neither comprehensively nor by using valid tools. Instead, limited examinations, such as visual acuity assessment, are made and done occasionally. Two questionnaires are used to assess the health status of driving license applicants and perform periodical examinations for professional drivers. They include the Epworth Sleepiness Scale and the Stop Bangs Questionnaire. The Epworth Sleepiness Scale only assesses the subjective sleepiness state (24) and the Stop Bangs Questionnaire assesses obstructive sleep apnea (25). However, screening tools for assessing drivers' health status need to be as comprehensive as possible and cover all aspects of physical health, which can contribute to accidents (22, 26).

One of the screening tools for identifying drivers license applicants' health problems is the Driver Medical Questionnaire (DMQ). The DMQ is a simple, short, and easily-applicable instrument, which assesses the most significant physical and mental health problems affecting traffic accidents in all ages. Yet it's Persian translation has not yet been confirmed. Its reliability and validity has not been tested in Iranian patients. The aim of this study was to translate the DMQ into Persian and evaluate its psychometric properties.

2. Objectives

A) Reveal the inter-rater reliability for test replicability (test-retest and Kuder-Richardson); B) Determine the internal consistency for PDMQ.

3. Methods

3.1. Design

This descriptive/methodological study was conducted on 360 traffic offenders whose cars had been seized by police between March 2015 and March 2016 and recruited from Tehran, Iran.

3.2. Instrument

The study instrument was the DMQ. This questionnaire was developed by David Shackleton in Occupation Health Solution, England, for the screening of drivers' health problems. The questionnaire was drafted in 1999 and revised in 2001, 2011, 2013, and 2014. The most recent version of the questionnaire was published in March 2014 (23). The DMQ contains 17 short items, which monitor the presence of different physical and mental health problems as well as medication used among drivers. The items screen for problems such as visual impairment, difficulty seeing well enough, epilepsy, attacks of dizziness or vertigo, weakness or numbness, severe head injuries or brain surgeries, hearing problems, disorders of the neck and the back, history of cancer, diabetes mellitus, cardiovascular disease, abnormal heart rate or rhythm, hypertension, psychiatric disorders, dependence on or abuse of drugs, alcohol, or other substances, the history of using medications that negatively affect driving, and any other health problems that can pose athreat to oneself or others while driving. These items assess risk-bearing health conditions, which can cause traffic accidents. The questionnaire is completed by drivers every 2 years and when the persons' competence for driving comes into question. The possible responses to the items are 'Yes' and 'No' (23), which respectively represent the presence or the absence of problems and are scored 1 and 0. Consequently, the total possible score on the questionnaire is 0 - 17. The presence of 3 or more problems indicates high-risk health condition and denotes incompetence for driving and the need for referral to occupational medicine specialists (23).

3.3. Translation Steps

The methods used to validate the DMQ included:

Translational validity: content validity and face validity.

Reliability tests: internal consistency (Kuder-Richardson 21 formula) and test-retest reliability.

A flow chart depicting the processes used to examine the validity of the DMQ is presented in Figure 1.

Initially, the necessary permission was obtained from the developer of the questionnaire. The English-Persian translation and the psychometric evaluation of the DMQ

were performed based on the protocol of the International Quality of Life Assessment Project and in the following steps (27).

Step 1; Translation: The questionnaire was translated from English into Persian by 2 independent native Persian speakers who were competent in text translation. Then, in a joint meeting, the translators and the authors unified the 2 translations in order to develop a single translation. Thereafter, 2 other translators were invited to independently back-translate the final Persian version into English. After that, the Persian-English translators and the authors held a meeting to generate a single version of the questionnaire from the 2 English translations. The final English version of the questionnaire was compared with the original English DMQ and approved by a physician who mastered both English and Persian. The final English version of the questionnaire was sent to the Occupation Health Solution, England. The institute confirmed the similarity between our English DMQ and the original version of the questionnaire.

Step 2; Validity assessment:

1. Content validity

To assess the questionnaire for appropriateness and relevance to the study's purpose, its content validity was measured. Content validity indicates that the content reflects a complete range of the attributes under study and is usually completed by 7 or more experts (28, 29). To estimate the content validity of the PDMQ, the researchers clearly defined the conceptual framework of the drivers' medical problems by conducting a thorough literature review and seeking expert opinion. Once the conceptual framework was established, 8 purposely chosen expert committee, in the areas of nursing, questionnaire design, and screening tools, were asked to review the draft 17-item DMQ to ensure it was consistent with the conceptual framework. Each reviewer independently rated the relevance of each item on the DMQ to the conceptual framework using a 4-point Likert scale (1 = not relevant, 2 = somewhat relevant, 3 = relevant, 4 = very relevant). The Content Validity Index (CVI) was used to estimate the validity of the items (30).

2. Face validity

Face validity indicates that the questionnaire appears to be appropriate to the purpose of the study and content area. It is the easiest validation process to undertake, however, it is the weakest form of validity. It evaluates the appearance of the questionnaire in terms of feasibility, readability, consistency of style and formatting, as well as the clarity of the language used (29). Thus, face validity is a form of usability rather than reliability. To assess the face validity of the as PDMQ, an evaluation form was developed to help respondents assess each question in terms of:

1) The clarity of the wording,

2) The likelihood that the target audience would be able to answer the questions,

3) The layout and style.

A total of 10 drivers were randomly selected and completed the face validity form on a Likert scale of 1 - 4, strongly disagree = 1, disagree = 2, agree = 3, and strongly agree = 4.

The face validity of the PDMQ was assessed by 10 drivers and a panel of 5 military doctors. They commented on the clarity, simplicity, and comprehensibility of the PDMQ items. If at least 80% of the assessors agreed on the clarity and the simplicity of each DMQ item, that item was considered to have face validity.

Step 3; Pilot study: A pilot study was done on a small sample of 45 traffic offenders recruited from 5 geographical areas of Tehran, Iran. The aim of the pilot study was to assess the drivers' comprehension, interpretation, and perception of the items, determine the amount of time needed for completing the questionnaire, and improve the wording as well as comprehensibility of the items.

Step 4; Reliability assessment: The reliability of the PDMQ was assessed through the internal consistency analysis and the test-retest reliability assessment techniques. The 45 traffic offenders were invited to complete the PDMQ twice, with a 14 day interval. Then, the Intraclass Correlation Coefficient (ICC) was calculated between the scores obtained from 2 measurement time points.

Step 5; Sampling: The required sample size was calculated based on the Cochrane formula of the drivers risky behaviors in previous studies ($d = 0.05, z = 1.96, P = 0.64$). As such, approximately 360 drivers were determined for this study (Figure 1).

Consequently, convenient samples of 360 drivers were recruited from among traffic offenders who had been referred to the Center for Seized Cars, Tehran, Iran. The drivers were included in the study if they were ages 18 years or older, could speak Persian, did not suffer from cognitive disorders, agreed to participate in the study, and had obtained their drivers license at least 1 year prior. They were asked to complete the PDMQ and a researcher-made demographic questionnaire.

3.4. Data analysis

The study data were analyzed using the SPSS software (v. 23.0). The Kuder-Richardson 21 (Kr21) formula was used to assess the internal consistency of the PDMQ while the test-retest reliability was assessed by calculating the ICC between the 2 measurements. Chi-square test and Fisher's exact test were conducted to assess the association between the drivers' health status and their demographic characteristics. All of the statistical analyses were performed by a significance level of less than $P < 0.05$.

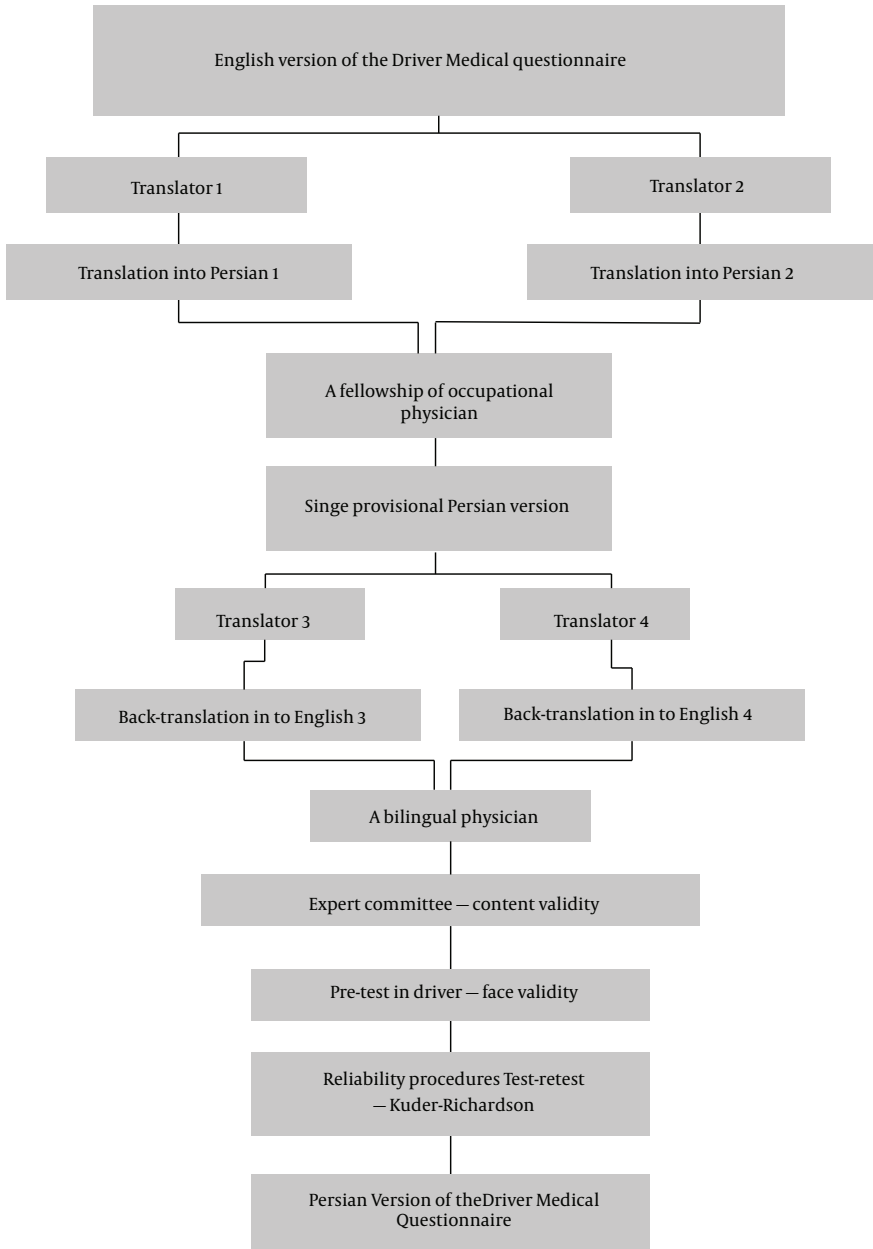

Figure 1. Diagram Representing the Protocol Used for Translation of the Driver Medical Questionnaire in to Persian

4. Results

All 17 items of the PDMQ had simple, clear, and appropriate wording. Most (80%) of the face validity assessors confirmed that with the exception of 2 items, the remaining items were clear and simple. The 2 items were reworded based on the military physicians and the drivers' comments.

The Kr21 value for the PDMQ was 0.68. The Kr21 values that are greater than 0.7 are considered satisfactory. The ICC between the scores at the 2 measurement time points was 0.948. ICC values are interpreted as poor (0 - 0.20), fair (0.21 - 0.40), moderate (0.41 - 0.60), good (0.61 - 0.80), and

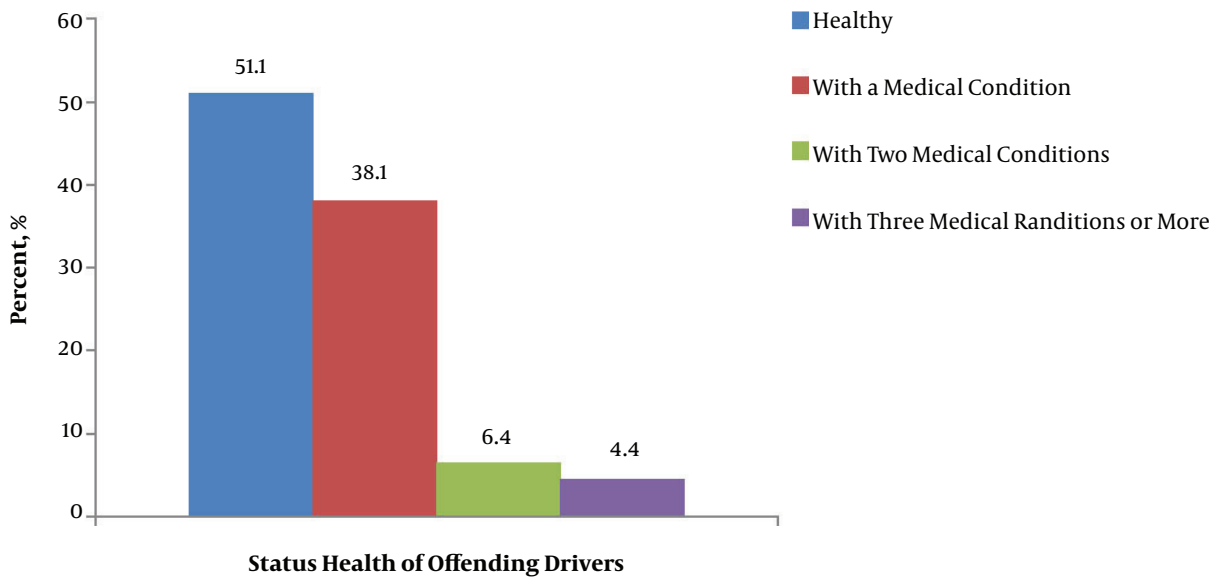

Figure 2. Status Health of Offending Drivers to Traffic Accident

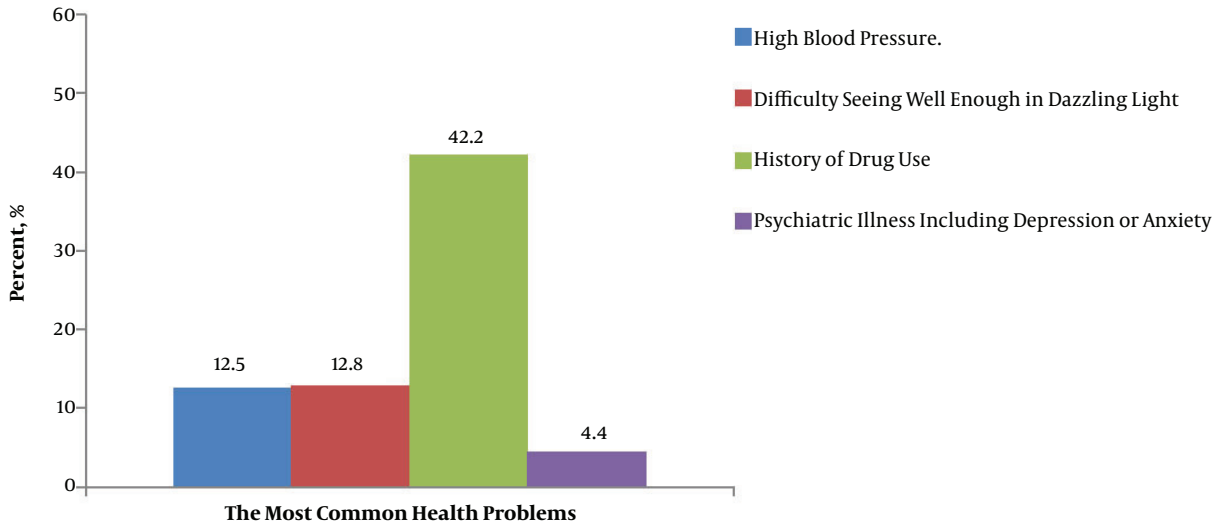

Figure 3. The Most Common Health Problems Reported by the Offending Drivers to Traffic Accident

very good (0.81 - 1).

Most of the traffic offenders were male (91.2%), aged 30 - 39 years (35.8%), had lees than- a diploma (61.94%), were self-employed (50.8%), and had a small income (48.1%). The drivers' health status was significantly correlated with a history of accidents in the past 3 years and a history of injury-associated accidents ($P < 0.01$; Table 1). Approximately half (51.1%) of the participants had no health problems, while 38.1% had 1 health problem, and 10.8% of them had 2 or more health problems (Table 2 and Figure 2). The most common health problems reported were hypertension (12.5%) and difficulty seeing well enough in dazzling light (12.8%) (Table 3 and Figure 3). Most participants (42.2%) reported using medications that affect the ability to drive safely. The most common medications used by the participants were antihypertensive agents (10%), antidepressants (4.4%), medications for the cardiovascular system (3.9%), and antidiabetic agents (1.7%) (Figure 4).

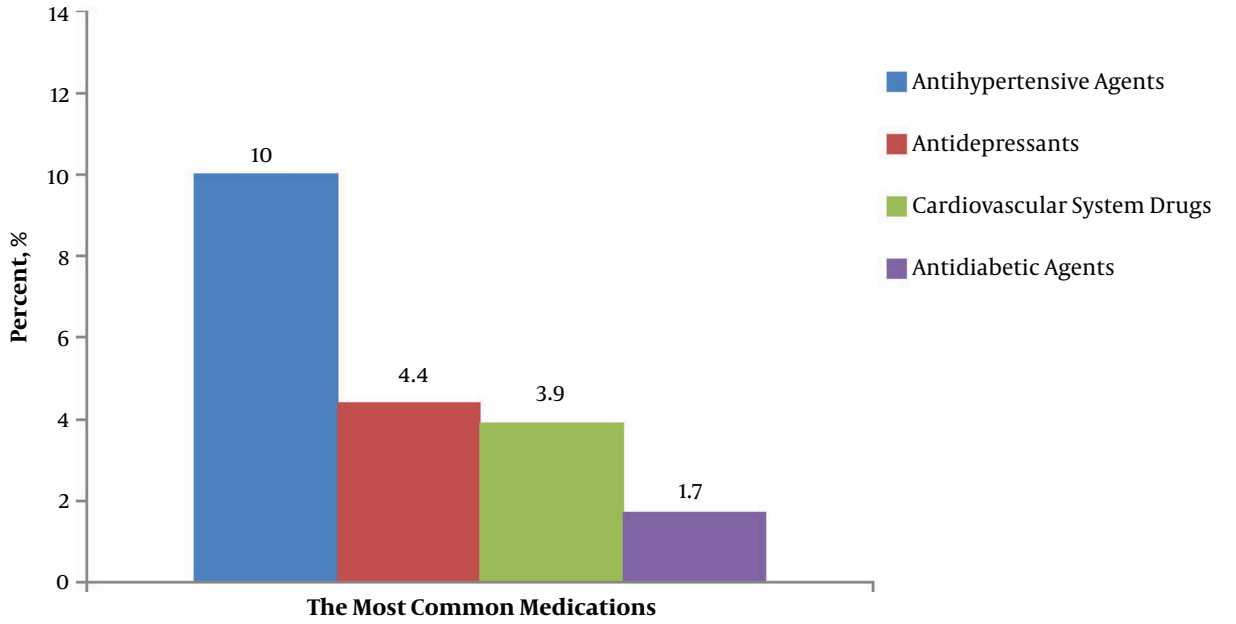

Figure 4. The Most Common Medications Used by the Offending Drivers to Traffic Accident

5. Discussion

Physical and mental health are significant factors affecting the drivers' performance. Some physical and mental health problem can cause negative traffic-related consequences. Using a valid screening tool can help accurately identify drivers' physical and mental health problems. This test is used to screen all drivers, while prediction of driving performance among the disabled should use other tests (31).

In the present study, the DMQ was translated into Persian and then, its psychometric properties were evaluated. The participants were able to answer the items on the PDMQ without difficulty. The findings revealed that the questionnaire has acceptable face validity, denoting that the face of the questionnaire is appropriate for measuring the intended variable. The results of internal consistency analysis, by using the Kr21 method, also indicated that the PDMQ has an acceptable internal consistency. The test-retest stability analysis, through calculating ICC, showed that the PDMQ has a high stability, confirming its high reliability. In designing a self-report fatigue questionnaire for intercity bus drivers, all 21 items had enough simplicity, clarity, and relevance criteria (CVR > 0.99, CVI > 0.75). The reliability of the final questionnaire was also confirmed (α = 0.93) (32). In this study there are similar statements of the current questionnaire. This questionnaire measured the bus drivers' fatigue.

The present study showed that young male traffic offenders are most frequently affected with RTI, which is in line with previous studies. For instance, Yousefzadeh et al., showed that the number of men involved in RTI was 3.6 times the women and about 50% of the drivers were 20 - 44 years old (33). Duke et al.,(2010) also reported that the rate of traffic offense is higher among men (13). The results of a study conducted in Iran on the gender of accident victims also reported that the male-female ratio was 4.2 to 1 (34). Elvik reported that the rate of risky driving-related behaviors among men is higher than women (35). Our findings indicated that most of the traffic offenders were aged 31 - 39 years. Roudsari et al.,(2004) also found that the mean age of drivers who suffered accidents in Iran was 31 (36). De Winter and Dodou(2010) reported the same finding (37). Attarchi et al.,(2012) found a significant correlation between age and the incidence of traffic accidents (38). All these findings highlighted the necessity to provide education to the drivers in this age group (39).

We also found that the drivers' health status was significantly associated with a history of accidents in the past 3 years and a history of injury-associated accidents. However, drivers' health status had no significant association with age, gender, marital status, educational attainment, employment status, driving experience, income, place of residence, type of car involved in the accident, the amount of drive time in a week, the distance traveled in a year (Km), or maximum speed in residential areas (Km/h).

One of the less expected results of the present study was the lack of relationship between drivers' health status incidents and the age and driving experience of the drivers. The most reasonable explanation for this fact is the so-called healthy driver phenomenon that drivers don't want to lose the gain of driving. It is known that driver's risk rise with age due to negative influences of road crashes (40).

The findings of the present study showed that approximately half of the participants had at least 1 health problem and approximately 10% had more than 3 health problems needing referrals to occupational medicine specialists. The most common health problems among the participants were hypertension and difficulty seeing in intense light or fog. In our study hypertension, which is the major risk of the ischemic heart disease or stroke, is the most common chronic pathology found in traffic offender drivers. This trend is in accordance with previous reports. Sadri(2015) also reported that hypertension is highly prevalent among bus drivers (41). Consistent with our findings, Sadeghi and Habibi(2009) reported that 50% of drivers had a history of back pain and 20% of them suffered from the problems of the digestive system (42). Redelmeier et al.,(2012) reported that fainting or dizziness and sleep disorders were the most common medical diagnoses among high-risk drivers (43). However, medical intervention, control of lifestyle, and relief of mental stress are required, especially for control hypertension in drivers.

The high prevalence of physical health problems among drivers and the significant association between health problems and history of accidents emphasize the real necessity of screening for identifying drivers' health problems in order to reduce the rate of accidents. Pepple and Adio(2014) reported that implementing screening procedures for identifying vision problems among elderly drivers who aged 65 or more significantly reduced the rate of accidents by 12% during a screening time period of 3 years (44). Driving is a risky task, which can cause irreversible damage to individuals and communities. Drivers' health status should be evaluated regularly in order to identify high-risk drivers, which can in turn reduce the rate of accidents that occur due to drivers' physical health problems. An electronic health record system should be developed in order to effectively monitor the drivers' health status over time.

One of the strengths of the present study was the strict adherence to the protocol for translating tools as proposed by the reliable sources (45). In this study we translated the DMQ into Persian and evaluated its psychometric properties. The study also faced several limitations including sampling from a small geographical area as well as data collection through a self-report technique. Information about medical conditions was obtained by self-report. As such, participants may forget or be unwilling to share certain information. However, previous research has reported that there is excellent agreement between self-report of medical conditions and confirmation using medical records.

5.1. Conclusion

The PDMQ is a simple, valid, and reliable tool for the screening of drivers' health problems. The items of the PDMQ are short and easy to comprehend. The scoring of the questionnaire can be done easily. The questionnaire is not time consuming and requires approximately 10 minutes to complete. Therefore, the PDMQ can be used for the screening of drivers' health problems in different situations. Further studies are still needed in order to evaluate the suitability of the PDMQ in other contexts.

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Footnotes

Authors' Contribution: Azam Saei: Study conception, data collection, and drafting of the manuscript, Ali Rahmani supervised the study, Abbas Ebadi performed statistical analysis, Hosein Mahmoudi, Masoud Sirati Nir, and Hamid Reza Khankeh were the study advisors, all of the authors critically evaluated the paper and provided the final draft.

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References

1. Organization WH. *Global status report on road safety 2015*. 2015.
2. Peden M. *World report on road traffic injury prevention*. Geneva: World Health Organization; 2004.

3. Leproust S, Lagarde E, Salmi LR. Systematic screening for unsafe driving due to medical conditions: still debatable. *BMC Public Health*. 2008;**8**:27. doi: 10.1186/1471-2458-8-27. [PubMed: 18215269].
4. Violence WHO, Prevention I, Organization WH. *Global status report on road safety 2013: supporting a decade of action*. World Health Organization; 2013.
5. Moafian G, Aghabeigi MR, Heydari ST, Hoseinzadeh A, Lankarani KB, Sarikhani Y. An epidemiologic survey of road traffic accidents in Iran: analysis of driver-related factors. *Chin J Traumatol*. 2013;**16**(3):140–4. [PubMed: 23735547].
6. Ardalan A, Masoomi G, Goya M, Sarvar M, Haddadi M, Miadfar J. Road traffic injuries: a challenge for Iran's health system. *Iran J Publ Health*. 2009;**38**(1):98–101.
7. Karacasu M, Er A. An analysis on distribution of traffic faults in accidents, based on driver's age and gender: Eskisehir case. *Procedia Soc Behav Sci*. 2011;**20**:776–85.
8. Shappell SA, Wiegmann DA. *Human Factors Investigation and Analysis of Accidents and Incidents. In: Houck JASJSM, editor. Encyclopedia of Forensic Sciences*. Waltham: Academic Press; 2013. p. 440–9.
9. Sagberg F. Driver health and crash involvement: a case-control study. *Accid Anal Prev*. 2006;**38**(1):28–34. doi: 10.1016/j.aap.2005.06.018. [PubMed: 16054104].
10. Classen S, Crizzle AM, Winter SM, Silver W, Eisenschenk S. Evidence-based review on epilepsy and driving. *Epilepsy Behav*. 2012;**23**(2):103–12. doi: 10.1016/j.yebeh.2011.11.015. [PubMed: 22227593].
11. Borowsky A, Shinar D, Oron-Gilad T. Age, skill, and hazard perception in driving. *Accid Anal Prev*. 2010;**42**(4):1240–9. doi: 10.1016/j.aap.2010.02.001. [PubMed: 20441838].
12. Clarke DD, Ward P, Bartle C, Truman W. Older drivers' road traffic crashes in the UK. *Accid Anal Prev*. 2010;**42**(4):1018–24. doi: 10.1016/j.aap.2009.12.005. [PubMed: 20441808].
13. Duke J, Guest M, Boggess M. Age-related safety in professional heavy vehicle drivers: a literature review. *Accid Anal Prev*. 2010;**42**(2):364–71. doi: 10.1016/j.aap.2009.09.026. [PubMed: 20159055].
14. Jayatilleke AU, Nakahara S, Dharmaratne SD, Jayatilleke AC, Poudel KC, Jimba M. Working conditions of bus drivers in the private sector and bus crashes in Kandy district, Sri Lanka: a case-control study. *Inj Prev*. 2009;**15**(2):80–6. doi: 10.1136/ip.2008.018937. [PubMed: 19346419].
15. Anderson JE, Govada M, Steffen TK, Thorne CP, Varvarigou V, Kales SN, et al. Obesity is associated with the future risk of heavy truck crashes among newly recruited commercial drivers. *Accid Anal Prev*. 2012;**49**:378–84. doi: 10.1016/j.aap.2012.02.018. [PubMed: 23036416].
16. Rodenstein D. Sleep apnea: traffic and occupational accidents–individual risks, socioeconomic and legal implications. *Respiration*. 2009;**78**(3):241–8. doi: 10.1159/000222811. [PubMed: 19494476].
17. Hilton MF, Staddon Z, Sheridan J, Whiteford HA. The impact of mental health symptoms on heavy goods vehicle drivers' performance. *Accid Anal Prev*. 2009;**41**(3):453–61. doi: 10.1016/j.aap.2009.01.012. [PubMed: 19393792].
18. Izadi N, Malek M, Aminian O, Saraei M. Medical risk factors of diabetes mellitus among professional drivers. *J Diabetes Metab Disord*. 2013;**12**(1):23. doi: 10.1186/2251-6581-12-23. [PubMed: 23725484].
19. Graveling AJ, Frier BM. Driving and diabetes: problems, licensing restrictions and recommendations for safe driving. *Clin Diabetes Endocrinol*. 2015;**1**:8. doi: 10.1186/s40842-015-0007-3. [PubMed: 28702227].
20. Roth GA, Forouzanfar MH, Moran AE, Barber R, Nguyen G, Feigin VL, et al. Demographic and epidemiologic drivers of global cardiovascular mortality. *N Engl J Med*. 2015;**372**(14):1333–41. doi: 10.1056/NEJMoa1406656. [PubMed: 25830423].
21. Li G, Brady JE, Chen Q. Drug use and fatal motor vehicle crashes: a case-control study. *Accid Anal Prev*. 2013;**60**:205–10. doi: 10.1016/j.aap.2013.09.001. [PubMed: 24076302].
22. Meuser TM, Berg-Weger M, Niewoehner PM, Harmon AC, Kuenzie JC, Carr DB, et al. Physician input and licensing of at-risk drivers: a review of all-inclusive medical evaluation forms in the US and Canada. *Accid Anal Prev*. 2012;**46**:8–17. doi: 10.1016/j.aap.2011.12.009. [PubMed: 22310038].
23. DVLA U. *At a Glance Guide to the Current Medical Standards of Fitness to Drive*. Swansea: Drivers Medical Group DVLA; 2010.
24. Sadeghniiat-Haghighi K, Moller HJ, Saraei M, Aminian O, Khajeh-Mehrizi A. The Epworth Sleepiness Scale for screening of the drowsy driving: comparison with the maintenance of wakefulness test in an Iranian sample of commercial drivers. *Acta Med Iran*. 2014;**52**(2):125–9. [PubMed: 24659070].
25. Ebrahimi MH, Sadeghi M, Dehghani M, Niiat KS. Sleep habits and road traffic accident risk for Iranian occupational drivers. *Int J Occup Med Environ Health*. 2015;**28**(2):305–12. doi: 10.13075/ijomeh.1896.00360. [PubMed: 26182925].
26. Salmi LR, Leproust S, Helmer C, Lagarde E. Assessing fitness to drive in the elderly and those with medical conditions: guidelines should specify methods and evidence. *Injur Prevent*. 2014:injuryprev–2013-040972.
27. Aaronson NK, Acquadro C, Alonso J, Apolone G, Bucquet D, Bullinger M, et al. International Quality of Life Assessment (IQOLA) Project. *Qual Life Res*. 1992;**1**(5):349–51. [PubMed: 1299467].
28. Stevens JP. *Applied multivariate statistics for the social sciences*. Routledge; 2012.
29. DeVon HA, Block ME, Moyle-Wright P, Ernst DM, Hayden SJ, Lazzara DJ, et al. A psychometric toolbox for testing validity and reliability. *J Nurs Scholarsh*. 2007;**39**(2):155–64. doi: 10.1111/j.1547-5069.2007.00161.x. [PubMed: 17535316].
30. Lynn MR. Determination and quantification of content validity. *Nurs Res*. 1986;**35**(6):382–5. [PubMed: 3640358].
31. Gouvier WD, Maxfield MW, Schweitzer JR, Horton CR, Shipp M, Neilson K, et al. Psychometric prediction of driving performance among the disabled. *Arch Phys Med Rehabil*. 1989;**70**(10):745–50. [PubMed: 2529835].
32. Lagarde E, Chastang JF, Lafont S, Coeuret-Pellicer M, Chiron M. Pain and pain treatment were associated with traffic accident involvement in a cohort of middle-aged workers. *J Clin Epidemiol*. 2005;**58**(5):524–31. doi: 10.1016/j.jclinepi.2004.09.008. [PubMed: 15845340].
33. Yousefzadeh S, Dafchahi MA, Maleksari HM, Moghadam AD, Hemati H, Shabani S. Epidemiology of Injuries and their Causes among Traumatic Patients Admitted into Poursina Hospital, Rasht. *J Kermanshah Univ Med Sci*. 2007;**11**(3).
34. Rasouli MR, Nouri M, Zarei MR, Saadat S, Rahimi-Movaghar V. Comparison of road traffic fatalities and injuries in Iran with other countries. *Chin J Traumatol*. 2008;**11**(3):131–4.
35. Elvik R. Why some road safety problems are more difficult to solve than others. *Accid Anal Prev*. 2010;**42**(4):1089–96. doi: 10.1016/j.aap.2009.12.020. [PubMed: 20441817].
36. Roudsari BS, Sharzei K, Zargar M. Sex and age distribution in transport-related injuries in Tehran. *Accident Anal Prev*. 2004;**36**(3):391–8.
37. de Winter JC, Dodou D. The Driver Behaviour Questionnaire as a predictor of accidents: a meta-analysis. *J Safety Res*. 2010;**41**(6):463–70. doi: 10.1016/j.jsr.2010.10.007. [PubMed: 21134510].
38. Attarchi MS, Dehghan F, Seyedmehdi SM, Mohammadi S. Traffic accidents and related injuries in Iranian professional drivers. *J Pub Health*. 2012;**20**(5):499–503.
39. Scott-Parker B, Proffitt C. Validation of the Behaviour of Young Novice Drivers Scale (BYNDS) in a New Zealand young driver population. *Accid Anal Prev*. 2015;**77**:62–71. doi: 10.1016/j.aap.2015.01.019. [PubMed: 25697670].
40. Bakhtiyari M, Mehmandar MR, Mirbagheri B, Hariri GR, Delpisheh A, Soori H. An epidemiological survey on road traffic crashes in Iran: application of the two logistic regression models. *Int J Inj Contr Saf Promot*. 2014;**21**(2):103–9. doi: 10.1080/17457300.2012.762027. [PubMed: 23356677].
41. Sadri G. A Model of Bus Drivers' Diseases: Risk Factors and Bus Acci-

dents. *Iran J Med Sci*. 2015;**27**(1):39–41.
42. Sadeghi N, Habibi E. The survey of relation between Musculoskeletal Disorders and Anthropometric Indices in the bus drivers in Isfahan. *Iran Occupation Health*. 2009;**6**(1):6–14.
43. Redelmeier DA, Yarnell CJ, Thiruchelvam D, Tibshirani RJ. Physicians' warnings for unfit drivers and the risk of trauma from road crashes. *N Engl J Med*. 2012;**367**(13):1228–36. doi: 10.1056/NEJMsa1114310. [PubMed: 23013074].
44. Pepple G, Adio A. Visual function of drivers and its relationship to road traffic accidents in Urban Africa. *Springerplus*. 2014;**3**:47. doi: 10.1186/2193-1801-3-47. [PubMed: 24505558].
45. Bernstein IH, Nunnally J. Psychometric theory. New York: McGraw-Hill Oliva, TA, Oliver, RL, MacMillan, IC (1992) A catastrophe model for developing service satisfaction strategies. *J Market*. 1994;**56**:83–95.

Table 1. Distribution of Study Subjects According to Demographic Characteristics and Its Relation to Drivers' Health

Variable		Number (%)	No Health Problems Number (%)	Unhealthy Drivers (at Least One Health Problem) Number (%)	Statistical Test / Sig
Age, years	20 >	19 (5.3)	14 (7.6)	5 (2.8)	$X^2 = 5.38$ p = 0.25
	21 - 29	94 (26.1)	51 (27.7)	43 (24.4)	
	30 - 39	129 (35.8)	61 (33.2)	68 (38.6)	
	40 - 49	77 (21.4)	39 (21.2)	38 (21.6)	
	> 50	41 (11.4)	19 (10.3)	22 (12.5)	
Sex	Female	32 (8.9)	14 (7.6)	18 (10.2)	$X^2 = 2.05$ p = 0.15
	Male	328 (91.1)	170 (92.4)	158 (89.8)	
Married	Single	104 (28.9)	47 (25.5)	57 (32.4)	$X^2 = 0.78$ p = 0.38
	Married	256 (71.1)	137 (74.5)	119 (67.6)	
Level of Education	Under Diploma	223 (61.9)	113 (61.4)	110 (62.5)	$X^2 = 8.93$ p = 0.11
	The academic	137 (38.05)	71 (38.6)	66 (37.5)	
Driving experience, years	1 >	12 (3.3)	5 (2.7)	7 (4)	$X^2 = 1.73$ p = 0.63
	1 - 5	51 (14.2)	23 (12.5)	28 (15.9)	
	> 6	292 (81.1)	154 (83.7)	138 (78.4)	
Employment status, years	Not have certification	5 (1.4)	2 (1.1)	3 (1.7)	$X^2 = 0.01$ p = 0.99
	Unemployed	45 (12.5)	23 (12.5)	22 (12.5)	
	self - employed	183 (50.8)	93 (50.5)	90 (51.1)	
	jobholder	92 (25.8)	48 (26.1)	45 (25.6)	
	Driver	39 (10.8)	20 (10.9)	19 (10.8)	
Income, Million/Rials	> 10	173 (48.1)	88 (47.8)	85 (48.3)	$X^2 = 5.24$ p = 0.15
	10 - 19	150 (41.7)	83 (45.1)	67 (38.1)	
	20 - 30	26 (7.2)	10 (5.4)	16 (9.1)	
	> 31	11 (3.1)	3 (1.6)	8 (4.5)	
Location in the last two years	Tehran	301 (83.6)	158 (85.9)	143 (81.3)	$X^2 = 1.4$ p = 0.23
	Township	59 (16.4)	26 (14.1)	33 (18.8)	
Type car crash	pride	246 (68.3)	132 (71.7)	114 (64.7)	$X^2 = 7.73$ p = 0.17
	Types of Peugeot	42 (11.7)	16 (8.7)	16 (14.8)	
	International car	28 (7.8)	12 (6.5)	16 (9.1)	
	Van	5 (1.4)	1 (0.5)	4 (2.3)	
	Other cars	39 (10.8)	23 (12.5)	16 (9.1)	
Annual mileage, Km	10000 >	114 (31.7)	61 (33.2)	53 (30.1)	$X^2 = 2.9$ p = 0.81
	11000 - 20000	101 (28.1)	50 (27.2)	51 (29)	
	21000 - 40000	72 (20)	38 (20.7)	34 (19.3)	
	41000 - 50000	11 (3.1)	6 (3.3)	5 (2.8)	
	> 50000	62 (17.2)	29 (15.7)	33 (18.2)	
history of injury - associated accidents	Yes	49 (13.6)	14 (7.6)	35 (19.9)	$X^2 = 11.53$ p = 0.001
	No	311 (86.4)	170 (92.4)	141 (80.1)	
Traffic accidents in the past 3 years that traffic offenses followed	None	268 (27.4)	150 (81.5)	118 (67)	$X^2 = 10.2$ p = 0.01
	> 2 accident	73 (20.3)	27 (14.7)	46 (26.1)	
	2 - 4 accident	12 (3.3)	5 (2.7)	7 (4)	
	4 accident >	7 (1.9)	2 (1.1)	5 (2.8)	
Maximum speed the city, km / h	50km/h >	120 (33.3)	66 (35.9)	54 (30.7)	$X^2 = 5.08$ p = 0.27
	51 - 100	210 (58.3)	108 (58.7)	102 (58)	
	101 - 150	18 (5)	7 (3.8)	11 (6.3)	
	> 150 km/h	12 (3.3)	3 (1.6)	9 (5.1)	