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Original article

MEDICAL FITNESS OF PROFESSIONAL DRIVERS IN CENTRAL TUNISIA

Belhadj Chabbah Narjes [1,2], Maoua Maher [1,2], Aloui Asma [1,2], Abidi Mansou r[1,3], Chelly Farah [1,4], Chouchane Asma [1,2], Bouhoula Maroua [1,2], Ouahchi Ines [1,5], Kacem Imène [1,2], Brahem Aicha [1,2], Kalboussi Houda [1,2], El maalel Olfa [1,2], Chatti Souhail [1,2], Mrizak Nejib [1,2]

1. University of Sousse, Faculty of Medicine of Sousse Ibn Al Jazzar, Sousse (Tunisia)
2. Department of Occupational Medicine, University Teaching Hospital Farhat Hached, Sousse, Tunisia
3. Department of Radiology, University Teaching Hospital Farhat Hached, Sousse, Tunisia
4. Department of Occupational Medicine, University Teaching Hospital Sahloul, Sousse, Tunisia
5. Department of Cytogenetic, University Teaching Hospital Farhat Hached, Sousse, Tunisia

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ABSTRACT

Drivers occupy a workstation that require safety measures. The objective of this paper was to assess the causes of occupational unfitness of professional drivers. This is a descriptive, retrospective study covering all cases of drivers sent for an evaluation of their fitness to work, carried out in the Department of occupational medicine at Farhat Hached teaching hospital in Sousse, from January 1st, 2008, until December 30th, 2020. 155 drivers were enrolled in this study. Most drivers drove buses (52.3%), 26.5% were diabetic, 29% had ophthalmological pathologies and 36.8% had chronic lower back pain. Seventy-four percent were defined unfit. Subjects over 50-years-old (p=0.034; OR = 2.45; 95% CI [1.05-5.71]), high job seniority (p=0.015; OR= 1.71; 95% CI [-7.60-0.81]), cardiac pathology (p=0.022; OR = 7.7; 95% CI [1.0-59.5]) and right and left single ocular visual acuity $\leq 5/10$ (p=0.008; OR = 10.43; 95% CI [1.31-82.91] and $p<10^{-3}$; OR = 17.51; 95% CI [2.23-137.5]) were significantly associated with a decision of unfitness. Regular medical surveillance of drivers is necessary and allows early detection of any deterioration in health that may constitute a contraindication to professional driving.

1. Introduction

The activity of driving for work purposes is defined in France by any activity of driving a motorized vehicle, registered or not, provided that the driving is carried out during work without including the journey. This activity concerns all types of motor vehicles with 2, 4 or more wheels, used inside or outside a company and in accordance with the Traffic laws [1].

The essential mission and role of the occupational physician is to avoid any deterioration employees' health due to their work, by deciding on the fitness to work of any employee. Once the professional activity involves driving (light vehicle, passenger vehicle, etc.), the occupational physician is required to determine the fitness to drive. The decision of aptitude is not taken lightly because driving a vehicle is a safety hazard [2].

Furthermore, the occupational physician is required to detect any alteration in the state of health that may constitute a contraindication to driving in the work context and to take charge of employees for whom driving has led to health alterations [3].

In Tunisia, Article 153-2 of the Labour Code assigns this task to the occupational physician who is responsible for examining and monitoring the health of workers and their physical abilities to perform the required work upon recruitment and during employment [4].

Today, occupational medicine plays an essential role in contractual relations, since any dismissal due to the employee's state of health is forbidden, unless it is certified by the occupational physician [5]; and it is only the occupational physician who can decide on the medical fitness of the employee for the job.

* Corresponding author: Belhadj Chabbah Narjes, *narcissechbh@gmail.com*
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This medical examination is compulsory not only in situations such as offences of involuntary violence [6,7] and involuntary manslaughter [8], but also for persons who have received a suspension their driver's license or who had their driving license revoked and are applying for a new one [9].

The occupational physician verifies the compatibility of the employee's health with the workstation and, if necessary, proposes the necessary adjustments. The employer is required to consider the recommendations and proposals for individual measures, such as transfers or position changes, justified by considerations relating to age, physical strength, or physical and mental health, unless he/she can justify reasons preventing him/her from following them [10].

In Tunisia, obtaining a driving license has been regulated. Article 12 of Decree No. 2000-142 of January 24th, 2000, and published in the Official Journal of the Tunisian Republic in 2002 [11], provides a detailed list of physical disabilities and diseases requiring a specific outfitting of vehicles and/or driver use of devices and prosthetics as well as other specific physical disabilities, which require the opinion of the specialized commission.

According to a report published by the "Health Watch Institute", concerning the epidemiological profile of drivers, it was shown that musculoskeletal disorders were the most common pathologies encountered in the context of professional driving, with a prevalence of 3.6% compared to 3.2% for the general population [12].

In France, according to the Western Society of Medicine and Occupational Health, for more than five thousand drivers recognized as unfit and compensated, the reason for unfitness was diagnosed by the occupational physician in more than 90% of cases. The main cause of unfitness were musculoskeletal disorders, followed by cardiovascular pathologies and especially coronary diseases, next to neuropsychiatric disorders [13].

Therefore, the occupational health physician is required to carry out an examination at the time of hiring as well as periodic examinations to detect any unfitness to start or continue driving activities, and to provide his evaluation to the employer who is responsible for deciding whether to reclassify the driver.

The objectives of this study were to identify the causes of unfitness of the analyzed sample and to develop recommendations for the prevention of the main causes of unfitness among professional drivers.

2. Methods

This is a retrospective study, with a cross sectional time evaluation of the professional drivers carried out from January 1st, 2008, until December 31st, 2020. This study was conducted at the department of occupational medicine and occupational pathologies at the Teaching Hospital of Farhat Hached in Sousse, focusing on all the records of drivers sent for fitness evaluations for the position of professional road driver. The evaluation of the professional development was carried out in December 2021.

Data collection was conducted retrospectively via the medical records of the sample subjects, by a single researcher. The data collection tool was a synoptic form with 5 main categories: socio-demographic characteristics, clinical examination data, job characteristics, medical and/or surgical pathologies posing a problem to fitness, medical opinion, and the company manager decision.

Data analysis was performed using IBM SPSS statistics (version 23.0).

For the descriptive study, numbers and percentages were calculated for qualitative variables and means, standard deviations, medians, and modes for quantitative variables.

For the analytical study, the statistical significance was set at 0.05. Comparison of qualitative values was performed using the "chi square" test, and comparison of qualitative and quantitative normal values was carried out with the "student t" test.

Multivariate analysis by multiple binary logistic regression was calculated with a statistical significance of 0.2 in the univariate study as the inclusion criterion for independent variables.

3. Results

During the study period, 155 drivers were visited in the occupational medicine and pathology department. All study subjects were males. Our study population had a mean age of 48.3 ± 7.6 years.

Drivers included in our study had an average professional seniority of 17.8 ± 8.9 years with a median of 17 years [1-42]. Among them, 89 drivers had a seniority of more than 15 years. Most of the professional drivers in our study drove buses and heavy trucks with 52.3% and 19.4% respectively. The most represented sectors were the public transport sector with 58.7% (91 cases) followed by the goods transport sector with 12.9% (20 cases). Only 34 professional drivers (21.9%) declared having had an accident at work. (Table 1)

		Number of cases	Percentage
Age classes (years)	30-39	18	11.6%
	40-49	67	43.2%
	50-60	64	41.3%
Gender	Female	0	0%
	Male	155	100%
Governorate	Sousse	76	49.03%
	Monastir	39	25.16%
	Kairouan	26	16.77%
	Mahdia	9	5.80%
Occupational seniority (years)	<6	15	9.7%
	[6-15]	50	32.3%
	≥16	89	57.4%
Type of vehicle	Bus	81	52.3%
	Heavy trucks	30	19.4%
	Taxi-louage	14	9%
	Ambulance	10	6.5%
	Others	20	12.8%
Fitness decision	Definitive unfitness	115	74.2%
	Temporary unfitness	20	12.9%
	Fitness with restrictions	20	12.9%

Table 1. Socio-demographic and occupational characteristics

The medical history of our population predominantly included musculoskeletal disorders, diagnosed in 92 studied subjects (59.4%), of which 36.8% (57 cases) had lower back pain.

Among the 155 drivers, 20.6% had high blood pressure and 26.5% were diabetic, i.e., 41 drivers, 36.58% were insulin dependent.

Ophthalmic diseases were found in 45 subjects (29%) of which refractive disorders were predominant with 11.6% of cases.

Only 24 drivers (15.5%) had heart disorders. Among them, 17 (11%) had coronary artery disease.

Respiratory diseases were present in 18 drivers (11.6%) of whom 8 drivers had COPD (5.2%) and 5 drivers had asthma (3.2%).

Only 19 subjects in the study presented neurological diseases such as vertigo for 6 drivers (3.9%) and epilepsy for 3 subjects (1.9%). With respect to psychiatric disorders, 10 subjects (6.5%) had a major depressive disorder.

During the consultation with the occupational physician, 115 professional drivers (74.2%) were determined to be definitively unfit to continue their activities as drivers.

Among our study population, 75 drivers (48.4%) were transferred to another position, while 25 drivers (16.1%) remained in the same position.

Although diabetes and hypertension were more common among drivers deemed unfit to drive, these diseases were not statistically associated with the decision to be unfit to drive with p= 0.18 and p= 0.054 respectively. Drivers of the ages of 50 years and older (p = 0.034 and OR = 2.45; 95% CI [1.05-5.71]), with longer job tenure as a driver (p = 0.015 and OR = 1.71; 95% CI [-7.60,-0.81]), and with cardiac disease (p = 0.022 and OR = 7.7; 95% CI [1.0-59.5]) were statistically associated with a decision of unfitness to drive.

Similarly, drivers with right and left monocular visual acuity <5/10 (p=0.008; OR=10.43; 95% CI [1.31-82.91] and p<10-3; OR=17.51; 95% CI [2.23-137.5]) were significantly more associated with an unfit decision. (Table 2)

		Medical fitness to drive		p-value	Crude-OR
		Fit	Unfit		[CI 95%]
Age range	<50 years	24 (72.7%)	62 (52.1%)	**0.034**	**2.45**
	≥ 50 years	9 (27.3%)	57 (47.9%)		**[1.05 – 5.71]**
Mean age		45.17 ± 8.28	49.19 ± 7.21	**0.006**	-
Mean occupational seniority		14.57 ± 7.72	18.78 ± 9	**0.015**	-
Medical past-history of diabetes	yes	6 (17.6%)	35 (28.9%)	0.18	-
	No	28 (82.4%)	86 (71.1%)		
Medical past-history of heart disorders	yes	1 (2.9%)	23 (19.0%)	**0.022**	**7,7**
	No	33 (97.1%)	98 (81.0%)		**[1.0 – 59.5]**
Visual acuity: Right eye	≤ 5/10	1 (3.6%)	17 (27.9%)	**0.008**	**10.43**
	> 5/10	27 (96.4%)	44 (72.1%)		**[1.31 – 82.91]**
Visual acuity: Left eye	≤ 5/10	1 (3.6%)	24 (39.3%)	**$p<10^{-3}$**	**17.51**
	> 5/10	27 (96.4%)	37 (60.7%)		**[2.23-137.5]**

Table 2. Unfitness for the driver position and associated factors

The multiple binary logistic regression model showed that unfitness was significantly associated with history of heart disease (p=0.038; ORa=9.49; 95% CI [1.13-79.54] and decreased binocular visual acuity <13/20 (p=0.006; ORa=18.94; 95% CI [2.36-151.64]). (Table 3)

	Initial model			Final model		
	p-value	OR	CI 95%	p-value	OR	ICI 95%
Age	0.034	2.45	[1.05- 5.71]			
Medical past-history of heart disorders	0.022	7.7	[1- 59.5]	**0.038**	9.49	[1.13-79.54]
Ophthalmologic Medical past-history	0.15	2	[0.76- 5.24]	-	-	-
Medical past-history of hypertension	0.054	3.25	[0.92- 11.44]	-	-	-
Medical past-history of diabetes	0.18	1.89	[0.72- 4.98]	-	-	-
Occupational seniority	0.015	1.71	[-7.6- - 0.81]	-	-	-
Type of driving license	0.09	1.96	[0.87- 4.4]	-	-	-
Decrease of binocular visual acuity	$p<10^{-3}$	20.05	[2.55- 157.27]	**0.006**	18.94	[2.36-151.64]

Table 3. Multiple binary logistic regression between unfitness and associated factors.

4. Discussion

Drivers' jobs represent a safety hazard. Fitness assessments in this context are crucial for the evaluation of the drivers' functional capacities, as well as understanding the different functions involved during the driving activity.

Eyesight is a fundamental aspect of automobile driving, providing visual information acquisition mechanisms, which also requires attention, particularly visual attention. Passive attention includes automatic processes, during which information is not sought, but imposed. Active attention, on the other hand, is used in actions in which information is sought according to the requirements of the task. In a driving situation, active attention allows us to anticipate certain actions, as it participates in the selection of information to be processed by resisting distraction and mobilizing available resources.

Therefore, the visual fitness for driving is mainly a function of the degree of visual acuity and the state of the binocular visual field [14]. Visual function is essential in driving because most of the information is relayed through the eyes [15, 16].

The results of our study showed that a decrease in monocular visual acuity in the right and left eye < 5/10 (p=0.008 and p<10-3) was significantly more associated with a decision of unfitness, and after the multiple binary logistic regression analysis, a decrease in binocular visual acuity < 13/20 was significantly correlated to a notice of unfitness.

Regardless of the type of vehicle, the most reported pathologies are musculoskeletal disorders, defined as a group of specific affections involving the soft tissues of the limbs and the back, which mainly result in pain and functional discomfort [17]. Musculoskeletal disorders are multifactorial pathologies with individual (age, gender, diabetes, obesity) and occupational components. Two types of occupational factors play a role in the occurrence of musculoskeletal disorders: biomechanical factors and psychosocial and organizational constraints [18].

In professional driving, the main risk factors identified were physical constraints (sitting position, carrying loads, exposure to vibrations), organizational constraints (driving durations, traffic, rest periods), and even psychosocial constraints (psychological demands, low hierarchical support, low decision latitude, perceived stress) [19,20].

A Belgian study has shown that exposure to long periods of monotonous driving with a low level of muscle activity was responsible for muscle fatigue [21]. This fatigue is objectified by the decrease in the amplitude of the EMG tracing in the neck, shoulder, and spine muscles during a driving activity, which would be due to the exposure to whole-body vibrations. This notion of whole-body vibration appears to be the main etiological factor. In the study of whole-body vibration, Chen et al. identified predictive factors of the magnitude of vibration, providing a possible alternative to direct measurements and facilitating studies in this area [22]. The following factors were identified as predictive of increased whole-body vibration: increased vehicle speed ($p < 0.0001$); small engine size ($p < 0.04$); driver weight (per 10 kg) ($p < 0.02$); driver age (per 10 years) ($p < 0.02$); use of a seat cushion ($p < 0.03$). Periods of traffic jams were responsible for a decrease in vibrations ($p < 0.02$).

In the more specific field of lumbar pathology, the lumbar spondylolisthesis of Taiwanese urban taxi drivers could be explained by the existence of shear forces that are continuously exerted on the spine (aggravated by vibrations that decrease the resistance capacity of the disc) and by lumbar trauma secondary to road accidents [23].

For rheumatological pathology, other non-physical factors not directly related to driving but to the characteristics of the professional activity, such as stress at work, job satisfaction, low social support, the feeling of overwork, the lack of means to perform a good quality job, uncertain job prospects, etc., may be elements involved in the genesis of these pathologies in professional drivers [24, 25].

In our study, rheumatological diseases were present in 92 drivers (59.4%), especially lower back pain (36.8%), but no significant association between rheumatological diseases and the unfitness of professional drivers was found.

Cardiovascular pathologies can be a reason for temporary or permanent unfitness to drive. In these situations, the compatibility with the maintenance of the driving license can only be validated if the pathologies are ruled out and driving conditions are compatible with road safety requirements [26]. To issue or maintain a driving license, the approved physician bases his assessment on anamnestic and clinical data and on the opinions of the specialists who follow the pathology. A limited-duration fitness assessment can be provided in situations requiring regular medical follow-up.

In our study, and after a multiple binary logistic regression, cardiac conditions were significantly correlated with a diagnosis of unfitness.

The activity of professional driver differs depending on the sector (industrial, tourism, and public transport), the nature of the subjects or products transported and the organization of work. To guarantee one's health as well as that of others, the professional driving sector requires prevention. It's based on a legal prevention, a collective technical prevention, and an individual technical prevention with the use, when indicated, of personal protective equipment (PPE) [27]. Medical prevention is ensured by medical examinations in the workplace, and in particular the pre-employment and periodic examinations, which may be more frequent (every six months) if specific medical monitoring is legally required.

5. Conclusions

An age over 50-years-old, a high job seniority, cardiac diseases and reduction of ocular visual acuity were associated with decisions of unfitness. Our findings can help identify medical conditions that need a closer screening during medical prevention examinations, especially among older professional drivers.

References

1. Dômont A, Wehbi V. Occupational medicine and work-related driving. Arch Mal Prof Environ. 2006;67(6):889‑98.
2. Giorgio M-T. Driving and health at work. Presse Médicale. 2015;44(9):931‑4.
3. Dômont A, Wehbi B. New medical contraindications to driving: impact on medical monitoring.Arch Mal Prof Env. 2006;67(2):229‑33.
4. Official Printing of the Republic of Tunisia Labor Code 2018. Website: www.iort.gov.tn
5. Art L.1133-3 of the Labor Code, relating to individual labor relation.
6. Sénéchal A, Manaouil C. Driving licenses and medical fitness. Presse Médicale. 2015;44(9):916‑22.
7. Section 2 : Des atteintes involontaires à l'intégrité de la personne (Articles 222-19 à 222-21) - Légifrance [Internet]. [cité 9 janv 2021]. Disponible sur: https://www.legifrance.gouv.fr/codes/id/LEGIARTI000031927885/2016-01-28/
8. Article 221-6-1 - Code pénal - Légifrance [Internet]. [cité 9 janv 2021]. Disponible sur: https://www.legifrance.gouv.fr/codes/article_lc/LEGIARTI000031927877/
9. Arrêté du 31 juillet 2012 relatif à l'organisation du contrôle médical de l'aptitude à la conduite.
10. Direccte des pays de la loire. Aptitude / inaptitude médicale au poste de travail. 9èmeédition; 31 janvier 2016. Disponible sur: http://www.pays-de-la-loire.direccte.gouv.fr/onglet Santé et sécurité au travail
11. Arrêté des ministres du transport et de la santé publique, fixant la liste des handicaps physiques et des maladies qui nécessitent un aménagement spécial des véhicules et/ou le port et l'utilisation par le conducteur d'appareils et de prothèses ainsi que les autres cas spéciaux d'handicaps physiques qui requièrent l'avis de la commission spécialisée indiquée à l'article 12 du décret n° 2000-142 du 24 janvier 2000.
12. Programme de surveillance des MCP. Les MCP chez les chauffeurs. Résultats 2007-2012. | Institut national de sécurité routière et de recherches [Internet]. [cité 9 janv 2021]. Disponible sur: https://www.inserr.fr/documents/programme-de-surveillance-des-mcp-les-mcp-chez-les-chauffeurs-resultats-2007-2012
13. Whebi V. Occupational physician in road transport. SMSTO ;2016.
14. Mechergui N., Bouladi M., Ben Osman I., Ladhari N., Youssef I., El Fekih L. Visual disorders and fitness for professional driving. La Tunisie médicale - 2020;98 (06): 480-487
15. Souhail H, Assoumou P, Birinda H, Mengome EM. Visual ability to driving: example of candidates for the driving license in Libreville. Pan Afr Med J. 2015;22:147. doi: 10.11604/pamj.2015.22.147.6811.
16. Huisingh C, McGwin G, Owsley C. Association of visual sensory function and higher-order visual processing skills with incident driving cessation. Clin Exp Optom. 2016;99(5):441-8.
17. Roquelaure Y, Ha C, Sauteron M. Experimental network for the epidemiological surveillance of musculoskeletal disorders in Pays de la Loire. General population surveillance of carpal tunnel syndrome in Maine-et-Loire in 2002. pp.56. [hal-03347726]

18. Briere J, Fouquet N, Ha C, Imbernon E, Plaine J, Riviere S, Yves Roquelaure, Madeleine Valenty. Des indicateurs en santé travail. Les troubles musculo-squelettiques du membre supérieur en France. 2019 sept p. 51. (Santé publique france).
19. Magnusson ML, Pope MH, Wilder DG, Areskoug B. Are occupational drivers at an increased risk for developing musculoskeletal disorders? Spine. 15 mars 1996;21(6):710‑7.
20. Michel A, Nicole V. What models to understand and prevent MSDs? For a holistic and dynamic approach,2008, Vol.2.
21. Hostens I, Ramon H. Assessment of muscle fatigue in low level monotonous task performance during car driving.J. Electromyogr. Kinesiol.2005;15(3):266‑74
22. Chen JC, Chang WR, Shih TS, Chen CJ, Chang WP, Dennerlein JT, Rayan LM,Christiani DC. Predictors of whole-body vibration levels among urban taxi drivers. Ergonomics. 2003;46(11):1075‑90.
23. Chen J-C, Chan WP, Katz JN, Chang WP, Christiani DC. Occupational and personal factors associated with acquired lumbar spondylolisthesis of urban taxi drivers. Occup Environ Med. 2004;61(12):992-8.
24. Funakoshi M, Tamura A, Taoda K, Tsujimura H, Nishiyama K. Risk factors for low back pain among taxi drivers in Japan. Sangyo EiseigakuZasshi. 2003;45(6):235-47.
25. Luoma K, Riihimäki H, Raininko R, Luukkonen R, Lamminen A, Viikari-Juntura E. Lumbar disc degeneration in relation to occupation. Scand J Work Environ Health. 1998; 24(5):358-66.
26. Bonnevie L. Syncope and conduct. Arch Mal CoeurVaiss - Prat. 2017;2017(255):16‑8.
27. Elisabeth A, Eric A. Heavy truck driver. [Internet]. bossons-fute.fr; 2001.