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DIFFERENCES IN BLOOD CIRCULATION FUNCTIONING IN TRUCK DRIVERS RELATED TO AGE, EXPERIENCE AND WORK REGIME

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Introduction. Hypertension results in about half of cases and days of temporary disability in drivers. Harmful factors of their work place (high neuro-emotional strain, hazardous situations, responsibility for other persons, vigilance at work, attention to devices, hypodynamia, noise, vibration, infrasound, etc.) can cause blood circulation system diseases. Age, experience and work regime caused changes in the circulatory system functioning in drivers remain insufficiently studied.

Purpose of the study. To reveal differences in the functioning of the blood circulation system related to age, experience and work regime characteristics in long-distance truck drivers.

Materials and methods. Truck drivers (56 men aged 28–64; M ± m: 50,2 ± 1,4), engaged in approximately 2-week long distance freight transportations, were observed by measuring heart rate, arrhythmia, systolic and diastolic blood pressure, height and weight. Hemodynamic parameters were calculated. Work experience of subjects was 8–47 years (31,4 ± 1,3), driver experience – 0–47 years (28,8 ± 1,5), long distance truck driver experience – 0–46 years (21,1 ± 1,5), night work experience – 0–40 years (17,4 ± 1,6). The data were analysed at $p < 0,05$.

Results. 49 % of truck drivers showed an increased blood pressure corresponding to mild or moderate hypertension; 57 % – showed cardiovascular system (CVS) functional state within below the average Class, including low (29 %) and very low Class (7 %); almost all (98 % of those surveyed) – disordered type of self-regulation of blood circulation (92 % – the vascular type), being a known risk factor of hypertension development. 68 % of drivers demonstrated the prevalence of parasympathetic activation in the CVS functioning that is associated with worsening of blood circulation, sympathetic-adrenal and nervous system states. 13 % of truck drivers manifested arrhythmia against the background of the increased BP reflecting the risk of sudden cardiac events. The functional state of the CVS in truck drivers changed to the below average Class when 43 y. o, to the low Class – when 56 y. o., before the established retirement age in Ukraine. After 20 years of work as a driver the state of the CVS is worsening up to the below average Class, after 37 years – to the low Class. The most critical parameters for adaptation to night work were revealed: arterial blood pressure (systolic, diastolic, pulse, mean-dynamic), index of insufficient blood circulation, the Kerdo's vegetative index, arrhythmia and (after 20 years of night work hours experience) stroke volume.

Conclusions. The unfavourable state and accelerated ageing of the CVS in truck drivers were revealed. Night driving causes specific unfavourable changes in the vascular part of CVS and also in the heart muscle functioning. Prophylactic measures are necessary to promote the health and to prolong the occupational longevity of truck drivers.

Key words: age, work experience, truck drivers, cardiovascular system, night work

Introduction

In Ukraine, cardiovascular pathology causes up to 68 % of deaths [1]. The most threatening type of its nosology – hypertension – is the cause of about half of cases and days of temporary disability among drivers [2]. Harmful work place factors can cause disorders in the blood circulation system (due to high neuro-emotional tension, hazardous situations, responsibility for other persons, vigilant work, attention to operation of devices, hypodynamia, noise, vibration, infrasound, etc.) [2–4]. It is proved that one of mechanisms of hypertension development is a disorder in self-regulation of blood circulation [5]. However, changes in the functioning of the blood circulatory system in drivers, related to age, experience and work regime characteristics, remain insufficiently studied.

The purpose of the study was to reveal the differences in the functioning of the blood circulation system in long-distance truck drivers with due account of age, experience and work regime characteristics.

Materials and methodsof the study

The research protocol was approved by the Bioethics Committee at the State Institution «Kundiiev Institute of Occupational Health of the National Academy of Medical Sciences of Ukraine». Practically healthy workers, after signing an informed consent, were invited to participate in the research. 56 truck drivers

(men aged 28–64 (M ± m: (50,2 ± 1,4) yrs), engaged in approximately 2-week long distance freight transportations and approximately in the same rest periods, were observed in the Health Care Centre for drivers. Their work regime covered mainly up to 9 hours of driving per day, with no longer than 4 hours of continuous driving; night work hours were rather at the choice of a driver. Work experience of subjects was 8–47 years (31,4 ± 1,3), driver experience – 0–47 years (28,8 ± 1,5), long distance truck driver experience – 0–46 years (21,1 ± 1,5), night work experience – 0–40 years (17,4 ± 1,6), intensive night work experience (4+ hours per night within 5+ nights per month) – 0–40 years (8,4 ± 1,5).

Heart rate (HR), arrhythmia, blood pressure systolic and diastolic (BPs, BPd) in the upper extremities were registered using a digital blood pressure monitor DS-1902 «Nissei». Height and weight were measured. Hemodynamic parameters were calculated: Pulse Pressure (PP = BPs–BPd), Mean-Dynamic Pressure (MDP = 0,42 • PP + BPd), Stroke Volume (SV = 100 + 0,5 • PP – 0,6 • BPd – 0,6 • Age), Cardiac Output (CO = SV • HR), Periphery Vascular Resistance (PVR = MDP • 1333 • 60/CO)), Kerdo's Vegetative Index (KVI = (1 – BPd/HR) • 100 %) [6], Circulatory Failure Index (CFI = BPs/HR) [7]. Also, blood circulation self-regulation type was calculated [5]. Blood pressure asymmetry was defined when the difference in BPs or BPd scores between left and right hands was higher than 10 mm Hg [8]. Blood pressure levels were evaluated using WHO-ISH Guidelines (1999) [9]. SV, CO and PVR levels were assessed using Buzunov's Classification (1991) [4]. The cardiovascular system (CVS) functional state was evaluated as a mean of these three parameter assessments [10]. The data were analysed at $p < 0,05$, using basic statistics, Pearson correlation, chi-square test (Ms Excel 2007). A mathematical model of the linear regression analysis was applied.

Results of the study and discussion

The mean group data showed normal pulse, high-normal arterial blood pressure and below the average levels of stroke volume, cardiac output and peripheral vascular resistance in the tendency to parasympathicotonia (negative KVI) (Table 1). No asymmetry in the arterial blood pressure of the upper extremities was found. The circulatory failure index was (1,76 ± 0,04) (from 1,12 to 2,46).

The individual data showed arterial hypertension in 49 % of the observed truck drivers: 28 % of them manifested mild hypertension, 21 % – moderate hypertension. High-normal blood pressure was registered in 21 % of truck drivers. The asymmetry in the arterial blood pressure of the upper extremities was found in 7 % of subjects, the boundary level of it (10 mm Hg) – in 21 % of subjects.

Arrhythmia was found in 13 % of truck drivers. Always it was accompanied with hypertension, only in one person – with high-norm BP.

The average Class of the cardiovascular system functioning was found in 39 % of subjects, 21 % – showed the below average Class, 29 % – low Class, 7 % – very low Class, only 2 % – showed higher than the average Class and 2 % – high Class (Figure). Similar distribution was found in parameters of the cardiac output (CVS-CO: $p < 0,3$), while peripheral vascular resistance and stroke volume showed even less favourable pictures due to the lower scores of the average Class and higher scores of lower Classes (CVS-PVR: $p < 0,04$; CVS-SV: $p < 0,0001$, by the chi-square test). The difference in distribution of drivers by Classes of PVR and SV were significant ($p < 0,03$), and even more significant – as compared to CO (PVR-CO: $p < 0,001$; SV-CO: $p < 0,0001$).

The disordered types of blood circulation self-regulation prevailed among truck drivers: 92 % of the examined subjects showed a vascular type, 6 % – a cardiac one. Only 2 % of truck drivers manifested a normal type.

The asymmetry in the arterial blood pressure of the upper extremities was found in 7 % of subjects, the boundary level of it (10 mm Hg) – in 21 % of subjects.

The Kerdo's vegetative index evidenced the balance between the sympathetic and parasympathetic nervous system activations in 5 % of subjects, the relative prevalence of sympathetic activation – in 27 % of subjects, parasympathetic activation – in 68 %. In this, the expressed sympathicotonia was found in 4 % of subjects, the expressed parasympathicotonia – in 38 %.

A significant ($p < 0,05$) negative correlation of night work experience with measured parameters of arterial blood pressure, arrhythmia, pulse and mean-dynamic pressure, circulatory insufficiency index, positive correlation – with the Kerdo's vegetative index, in the absence of correlation of these blood circulation parameters with age were revealed (Table 2).

Table 1

Hemodynamic parameters in truck drivers (N = 56)

№	Hemodynamic parameters	Min	Max	M ± m	Assessment of the mean value of the parameter	References
1	BPs on the left hand (mm Hg)	110	170	135 ± 2	High-norm	WHO-ISH Guidelines, 1999
2	BPd on the left hand (mm Hg)	68	104	86 ± 1	High-norm	WHO-ISH Guidelines, 1999
3	HR on the left hand (beats per minute)	59	110	78 ± 1	Norm	
4	BPs on the right hand (mm Hg)	110	185	134 ± 2	High-norm	WHO-ISH Guidelines, 1999
5	BPd on the right hand (mm Hg)	70	117	86 ± 1	High-norm	WHO-ISH Guidelines, 1999
6	BPs difference on the left and right hands (mm Hg: by abs, |by modules|)	-16 |0|	15 |16|	0 ± 1 |4 ± 1|	Norm	Cheremisina A.Yu., et al., 2013
7	BPd difference on the left and right hands (mm Hg: by abs, |by modules|)	-19 |0|	15 |19|	-1 ± 1 |4 ± 1|	Norm	Cheremisina A. Yu., et al., 2013
8	Stroke Volume (ml)	22,1	80,1	44,0 ± 1,86	Below average	Buzunov V. A., 1991
9	Cardiac Output (ml)	1569	6408	34,39 ± 117,0	Below average	Buzunov V. A., 1991
10	Periphery Vascular Resistance (KPa • s/l)	1382	5846	2628 ± 104	Below average	Buzunov V. A., 1991
11	Kerdo's Vegetative Index (c. u.)	-52,54	24,76	-10,98 ± 2,48	Tendency to parasympathicotonia	Kérdö I., 1966

The significant negative correlations of total and driver work experiences were found with BPd. The expressed age- and experience-dependent decrease in stroke volume, cardiac output and increase in peripheral vascular resistance were observed (except for intensive night work experience for all three parameters, and also night work experience – for PVR at the lowest correlation coefficients for SV and CO – as compared to age and other kinds of experience). The highest correlation coefficients for SV, CO and PVR were found with age.

The cardiovascular system functioning in drivers changes from average to the below average Class in the age of 43, with a total work experience of 23 years, with a driver's experience of 20 years, with long distance truck driver experience – of 10 years (Table 3). (No possibility to count this number for night work experience because parameter PVR changed this border beyond work experience (theoretically – according to the linear regression model)). The change from the below average to the low Class took place in the age of 56, with a total work experience – of 39 years, driver's experience – of 37 years, long distance truck driver experience – of 31 year, night work experience – of 35 years.

In this, PVR changes to lower Classes always earlier as compared to SV: to below the average class – for 11 years of the age (47–36 = 11), 16 years of the total work experience (28–12 = 16), 18 years of a driver's experience (26–8 = 18); to the low Class – for 3–7 years of age-experience parameters, except night work experience – when SV changes for 7 years earlier as compared to PVR. Regression model showed the PVR change from average to below average Class occurred before start of long distance truck driver or night work experience, hence there were no possibility to compare PVR and SV at these points numerically but for sure the PVR change took place earlier as compared to SV.

The mean group data of the registered parameters showed high-normal level of BP, being traditionally considered as a risk factor for hypertension development. In 2017, the American College of Cardiology proved to consider it as the Stage 1 of Hypertension based on the association between BPs/BPd and car-

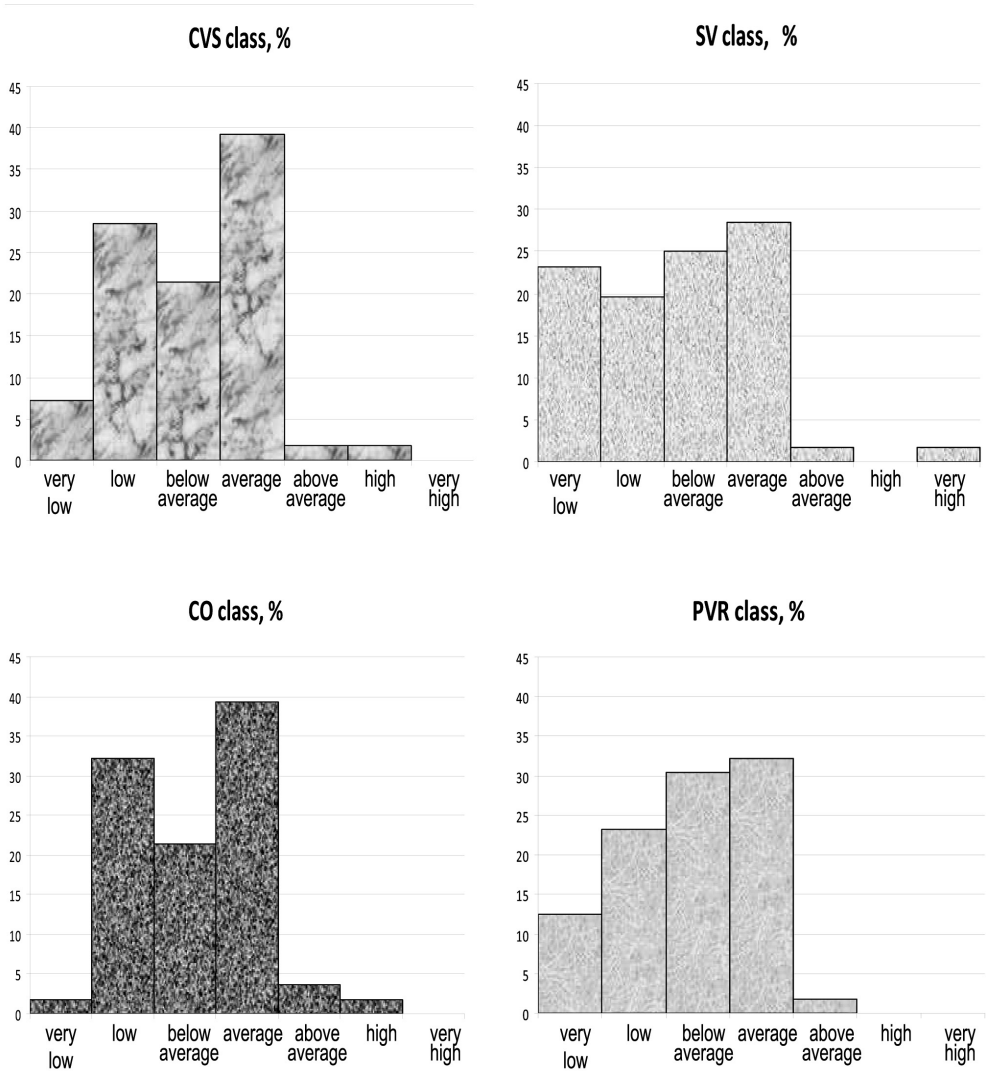

Figure. Distribution of truck drivers by Classes of functional state of the cardiovascular system in different parameters (by Buzunov's Classification, 1991 [4]) (N = 56)

X-axis – Classes of functional state of the cardiovascular system,

Y-axis et al., number of subjects, %.

diovascular disease risk: the hazard ratios for coronary heart disease and stroke were between 1,5 and 2,0 for the comparison of BPs/BPd of 130–139/85–89 mm Hg versus < 120/80 mm Hg [11]. In this, the calculated hemodynamic parameters showed the below average Class levels, evidencing unfavourable changes in the CVS of truck drivers.

The individual data provided additional evidences on unfavourable changes in CVS in truck drivers: about half of subjects showed arterial hypertension (49 %), one in five showed high-normal BP (21 %) – hence altogether – 70 % of subjects were found within the hazard zone. More than half of subjects (57 %) showed CVS functional state within below the average Class, including low (29 %) and very low Class (7 %).

The asymmetry in the arterial blood pressure of the upper extremities was found in 7 % of subjects, the boundary level of it (10 mm Hg) – in 21 % of subjects. The number 7% would not look bad considering that amongst hypertensive group it was, for example, 16 % of patients [8], and half of the observed drivers showed hypertension. But three times a large group of subjects showed the boundary level of the asymmetry in BP pointing the unfavourable processes development in CVS regulation.

Table 2

Correlation coefficients of hemodynamic parameters with age and work experience in truck drivers (N = 56)

Hemodynamic parameters	Age	Total work experience	Driver work experience	Long distance truck driver experience	Night work experience	Intensive night work experience
BPs on the left hand					-0,388**	-0,370**
BPs on the right hand					-0,377**	-0,372**
BPd on the left hand		-0,262*			-0,329*	-0,292*
BPd on the right hand			-0,265*		-0,282*	-0,295*
Arrhythmia					-0,276*	-0,268*
Pulse pressure					-0,270*	-0,272*
Mean-Dynamic Pressure					-0,389**	-0,366**
Stroke Volume	-0,631***	-0,552***	-0,573***	-0,444***	-0,394**	
Cardiac Output	-0,551***	-0,482***	-0,459***	-0,405**	-0,277**	
Periphery Vascular Resistance	0,376**	0,271*	0,272*	0,278*		
Kerdo's Vegetative Index					0,271*	
Circulatory Failure Index					-0,359**	-0,263*

*Note. Significant correlation coefficients are presented: *p < 0,05, **p < 0,01, ***p < 0,001.*

Two-thirds of truck drivers (68 %) demonstrated the prevalence of parasympathetic activation of the CVS functioning (according to Kerdo's index), more than half of which demonstrated pronounced parasympathicotonia (38 %). In the literature the growth in the parasympathetic influences is associated with the increase in the efforts of blood circulation and sympathetic-adrenal system, with the decrease in the adaptive resources of the CVS and worsening of the nervous system state [12, 13].

98 % of subjects manifested a disordered type of self-regulation in blood circulation. This figure is higher as compared to other occupational groups – constructor-designers (62 %), engineer-mathematicians (81 %) or air traffic controllers (82 %) [14]. The disorders in blood circulation self-regulation is a risk factor of hypertension development [5]. The unfavourable state of the CVS in the observed group can be partially caused by relatively high mean age (about 50 years – as compared to 40 years for the most other occupations). Nevertheless, the results of the followed analysis showed harmful effects of occupational factors and specific work regimes.

The revealed age-related increase in PVR along with the decrease in SV and CO is consistent with numerous literature data, evidencing the typical aging process in the CVS [15, 16] (Table 2). At the same time, the temporal limits of the lowering of these parameters (Table 3) evidence the accelerated rates of the CVS ageing in truck drivers – earlier than the established pensioned age in Ukraine: by 17 years earlier CVS functional state changes to the Class below average (60 y. o. – 43 y. o. = 17 y. o.), by 4 years – to the low Class (60 y. o. – 56 y. o. = 4 y. o.).

The time limits for worsening the CVS functional state from the average to the below average Class depending on different characteristics of work experience varied for 13 years (from 10 to 23 years), for worsening to the low Class – varied in a smaller range – for 8 years (from 31 to 39 years), which may reflect a direction to natural occupational selection – retirement from their occupation by persons with unfavourable state of the circulatory system. In this, the most early change was related on long-distance truck driver experience (10 or 31 year correspondingly), pointing probably specific complex of work conditions in the occupation as unfavourable factors for CVS functional state.

The correlation analysis showed some parameters in the functioning of the CVS that were the most sensitive for truck driver night working: BP (and related parameters – PP, MDP and CFI) and arrhythmia negatively correlated, KVI – correlated positively with night work experience without expressed correlation with age and even other parameters of work experience (except for BPd that correlated negatively with

Table 3

Age and experience, in which parameters of cardiovascular system in truck drivers change into the lower Class of functional state – according to linear regression model (by Buzunov's Classification, 1991 [4])

Parameters	Changes into the Class	Age	Total work experience	Driver work experience	Long-distance truck driver experience	Night work experience
SV	Below average	47	28	26	16	12
	Low	56	38	36	31	28
CO	Below average	47	28	26	16	11
	Low	60	43	43	37	40
PVR	Below average	36	12	8	-1	-
	Low	52	35	33	24	35
CVS	Below average	43	23	20	10	-
	Low	56	39	37	31	35

total and driver work experience) (Table 2). Hence, truck drivers with high scores of BP and listed related parameters, as well as those with arrhythmia refuse from night works. A special sensitivity of cardiac muscle to night work is illustrated also by the revealed fact that SV changes from below average to the low Class for 7 years of night work experience earlier as compared to PVR (35–28 = 7) (Table 3) – just in the opposite to regularities found in other parameters of work experience of the subjects and also in the same parameter at the earlier stage of a change (from the average to the below average Class). This goes right with known from literature direct unfavourable effects of night shifts on the heart work [17] that is found to be manifested in truck drivers in the second part of their work experience history (after 20 years of night work experience, or after about 40 years old).

Positive correlation of KVI and night work experience reflects the relative increase in sympathetic and decrease in parathympathetic influences in CVS functioning regulation that is characteristic for overfatigue based on the disinhibition and intensification of the excitation processes that is developed at night shifts [18] and also is found under the states of the decreased heart safety [19–21], and in our previous research – in night workers [22].

Each eights truck driver manifested arrhythmia against the background of an increased BP that is considered in literature as an increased risk of a sudden cardiac death [23], the known trigger of which is sympathetic activation [19, 24] that in our research was found with an increase of night driving experience (according to KVI, Table 2).

Negative correlation of BPd with total and driver work experience can reflect the significance of the attention as an occupationally vital function for drivers: it is shown that BPd increases when attention function is intensified [25]. Probably drivers with initially higher scores BPd are quitting the occupation.

Less favourable characteristics of PVR and SV distribution (Figure) as compared to CO can be explained by Anokhin's theory of functional systems if CO is considered as a system-forming factor in the CVS functioning [26].

Conclusions

1. The unfavourable state of the circulatory system in truck drivers was revealed: 49 % of them showed an increased blood pressure corresponding to mild or moderate hypertension; 57 % – showed CVS functional state within below the average Class, including low (29 %) and very low Class (7 %); almost all (98 % of those surveyed) – disordered type of self-regulation of blood circulation (92 % – the vascular type), which is a known risk factor of hypertension development. 68 % of drivers demonstrated the prevalence of parasympathetic activation in the CVS functioning that is associated with worsening of blood circulation, sympathetic-adrenal and nervous system states. Arrhythmia was found in 13 % of truck drivers against the background of increased blood pressure reflecting the risk of sudden cardiac events.
2. The accelerated CVS ageing in truck drivers was found: the CVS functional state becomes lower than the average Class from 43 y. o., low – from 56 y. o. – before the established retirement age in Ukraine. In 20 years of driver work experience the CVS functional state is worsening to the below

average Class, in 37 years – to the low Class. This causes a need in prophylactic measures to promote the health and to prolong the occupational longevity of truck drivers.

3. Night driving causes specific unfavourable changes in vascular part of CVS and also in heart muscle functioning: parameters of arterial blood pressure (systolic, diastolic, pulse, mean-dynamic), circulatory insufficiency index, Kerdo's vegetative index, arrhythmia and (after 20 years of night work experience) stroke volume are the most critical for truck driver adaptation to night work.

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ОСОБЛИВОСТІ ФУНКЦІОНУВАННЯ СИСТЕМИ КРОВООБІГУ, ЩО ПОВ'ЯЗАНІ З ВІКОМ, СТАЖЕМ І РЕЖИМОМ РОБОТИ ВОДІЇВ-ДАЛЕКОБІЙНИКІВ

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Вступ. Гіпертонія є причиною близько половини випадків і днів тимчасової непрацездатності у водіїв. Шкідливі чинники умов їхньої праці (високе нервово-емоційне напруження, небезпечні ситуації, відповідальність за інших, пильна робота, увага до приладів, гіподинамія, шум, вібрація, інфразвук та ін.) можуть викликати захворювання системи кровообігу. Зміни в функціонуванні системи кровообігу, що зумовлені віком, стажем і режимом роботи водіїв, залишаються вивченими недостатньо.

Мета дослідження – виявити особливості функціонування системи кровообігу у водіїв-далекобійників, що пов'язані з характеристиками їхнього віку, стажу та режиму праці.

Матеріали та методи дослідження. Водії-далекобійники (56 чоловіків у віці 28–64 років; M ± m: (50,2 ± 1,4), які виконують біля 2-тижневі перевезення, були обстежені шляхом вимірювання частоти серцевих скорочень, аритмії, систолічного та діастолічного артеріального тиску (АТ), зросту й ваги. Обчислювали параметри гемодинаміки. Стаж роботи обстежених склав 8–47 років (31,4 ± 1,3), стаж роботи водієм – 0–47 років (28,8 ± 1,5), стаж роботи водієм-далекобійником – 0–46 років (21,1 ± 1,5), стаж нічних робіт – 0–40 років (17,4 ± 1,6). Дані аналізувалися на рівні $p < 0,05$.

Результати. У 49 % водіїв-далекобійників зареєстровано підвищений АТ, що відповідав легкому або помірному ступеню гіпертонії; у 57 % – виявлено функціональний стан серцево-судинної системи (ССС) у зоні нижче середнього класу, у тому числі в зоні низького (29 %) і дуже низького класів (7 %); майже всі (98 % обстежених) мали порушений тип саморегуляції кровообігу (92 % – судинний), який є відомим фактором ризику розвитку гіпертонії. У 68 % водіїв виявлено переважання парасимпатичної активації в функціонуванні ССС, що асоціюється з погіршенням кровообігу, стану симпато-адреналової та нервової систем. У 13 % водіїв виявлена аритмія на фоні підвищеного АТ, що свідчить про ризик раптових серцевих інцидентів. Функціональний стан ССС водіїв-далекобійників переходить в клас нижче середнього з 43 років, у низький клас – з 56 років – до встановленого в Україні пенсійного віку. Через 20 років роботи водієм функціональний стан ССС погіршується до класу нижче середнього, через 37 років – до низького класу. Виявлено найкритичніші параметри адаптації до нічних робіт: АТ (систолічний, діастолічний, пульсовий, середньодинамічний), індекс недостатності кровообігу, вегетативний індекс Кердо, аритмія і (після 20 років стажу з нічними годинами робіт) систолічний об'єм крові.

Висновки. Було виявлено несприятливий стан і прискорене старіння ССС у водіїв-далекобійників. Нічні роботи викликають специфічні несприятливі зміни в судинній ланці ССС водіїв, а також у функціонуванні серцевого м'яза. Для збереження здоров'я та продовження професійного довголіття водіїв-далекобійників необхідні профілактичні заходи.

Ключові слова: вік, стаж роботи, водії-далекобійники, серцево-судинна система, нічна робота

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ОСОБЕННОСТИ ФУНКЦИОНИРОВАНИЯ СИСТЕМЫ КРОВООБРАЩЕНИЯ, СВЯЗАННЫЕ С ВОЗРАСТОМ, СТАЖЕМ И РЕЖИМОМ РАБОТЫ ВОДИТЕЛЕЙ-ДАЛЬНОБОЙЩИКОВ

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Введение. Гипертония является причиной около половины случаев и дней временной нетрудоспособности у водителей. Вредные факторы условий их труда (высокое нервно-эмоциональное напряжение, опасные ситуации, ответственность за других, бдительная работа, внимание к приборам, гиподинамия, шум, вибрация, инфразвук и др.) могут вызывать заболевания системы кровообращения. Изменения в функционировании системы кровообращения, обусловленные возрастом, стажем и режимом работы водителей, остаются изученными недостаточно.

Цель исследования – выявить особенности функционирования системы кровообращения у водителей-дальнобойщиков, связанные с характеристиками их возраста, стажа и режима труда.
Материалы и методы исследования. Водители-дальнобойщики (56 мужчин в возрасте 28–64 лет; M ± m: (50,2 ± 1,4), совершающие около 2-недельные перевозки, были обследованы путем измерения частоты сердечных сокращений, аритмии, систолического и диастолического артериального давления (АД), роста и веса. Вычислялись параметры гемодинамики. Стаж работы обследованных составил 8–47 лет (31,4 ± 1,3), стаж работы водителем – 0–47 лет (28,8 ± 1,5), стаж работы водителем-дальнобойщиком – 0–46 лет (21,1 ± 1,5), стаж ночной работы – 0–40 лет (17,4 ± 1,6). Данные анализировались на уровне $p < 0,05$.
Результаты. У 49 % водителей-дальнобойщиков зарегистрировано повышенное АД, соответствующее легкой или умеренной степени гипертонии; у 57 % – выявлено функциональное состояние сердечно-сосудистой системы (ССС) в зонах ниже среднего класса, в том числе в зоне низкого (29 %) и очень низкого классов (7 %); почти все (98 % обследованных) имели нарушенный тип саморегуляции кровообращения (92 % – сосудистый), который является известным фактором риска развития гипертонии. У 68 % водителей выявлено преобладание парасимпатической активации в функционировании ССС, что ассоциируется с ухудшением кровообращения, состояния симпато-адреналовой и нервной систем. У 13 % водителей обнаружена аритмия на фоне повышенного АД, что свидетельствует о риске внезапных сердечных инцидентов. Функциональное состояние ССС водителей-дальнобойщиков переходит в класс ниже среднего с 43 лет, в низкий класс – с 56 лет – до установленного в Украине пенсионного возраста. Через 20 лет работы водителем функциональное состояние ССС ухудшается до класса ниже среднего, через 37 лет – до низкого класса. Выявлены наиболее критичные параметры адаптации к ночным работам: АД (систолическое, диастолическое, пульсовое, среднединамическое), индекс недостаточности кровообращения, вегетативный индекс Кердо, аритмия и (после 20 лет стажа с ночными часами работ) систолический объем крови.
Выводы. Выявлено неблагоприятное состояние и ускоренное старение ССС у водителей-дальнобойщиков. Ночные работы вызывают специфические неблагоприятные изменения в сосудистом звене ССС, а также в функционировании сердечной мышцы. Для сохранения здоровья и продления профессионального долголетия водителей-дальнобойщиков необходимы профилактические мероприятия.

Ключевые слова: возраст, стаж работы, водители-дальнобойщики, сердечно-сосудистая система, ночная работа

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