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The influence of sedentary and shift work on work ability and risk factors for cardiovascular diseases

Утицај седентарног и рада у сменама на радну способност и фактори ризика за настанак кардиоваскуларних болести

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SUMMARY

Introduction/Objective In modern society, there`s an increasing number of occupations that require sedentary work, with a growing need to be performed in shifts. This study examined how these two work modalities affect the work ability and health status of workers.

Methods The study included taxi drivers and sanitary workers, further sub-classified into two groups depending on their shift work. The Work Ability Index (WAI) questionnaire was used to assess the work ability of participants. Also, anthropometric measurements and the determination of standard biochemical parameters and the levels of soluble adhesive molecules –intercellular adhesion molecule-1 (sICAM) and vascular cell adhesion molecule-1 (sVCAM) in blood samples, before and after work, were used to evaluate the impact of sedentary and shift work on the risk factors for cardiovascular diseases (CVDs).

Results Night shift taxi drivers (TD-NS) had significantly lower total WAI scores compared to day shift sanitary workers (SW-DS). The WAI3, anthropometric measurements, and lipid profile of study participants indicated that these two groups also differed in the number of obese and hypertensive individuals. Although the study groups didn`t differ in sICAM levels, sVCAM levels of TD-NS were significantly higher than those of SW-DS both before and after the work.

Conclusion Sedentary and shift work have synergistic effects in reducing work ability and promoting CVD development by modifying traditional risk factors.

Keywords: sedentary work; shift work; work ability; obesity; hypertension

САЖЕТАК

Увод/Циљ У модерном друштву је све већи број послова који захтевају седентарни начин рада, уз повећану потребу за сменским радом. У овом истраживању испитивали смо како ова два радна модалитета утичу на радну способност и здравље радника.

Методе Истраживање је обухватало таксиста и санитарне раднике даље подељене у две групе, у зависности од њиховог рада у сменама. Упитник Индекса радне способности (ИРА) је коришћен да се добију подаци о радној способности испитаника. Како бисмо испитали утицај седентарног начина рада и рада у ноћним сменама на факторе ризика за настанак кардиоваскуларних болести (КВБ), спроведена су антропометријска мерења, као и одређивање стандардних биохемијских параметара и нивоа солубилних адхезивних молекула –интерћелијски адхезивни молекул-1 (*sICAM*) и васкуларни ћелијски адхезивни молекул (*sVCAM*) у крви узоркованом пре и након посла.

Резултати Возачи таксија у ноћним сменама (ВТ-НС) имали су значајно нижи ИРА у односу на санитарне раднике у дневним сменама (СР-ДС). Вредности ИРА3, антропометријска мерења и липидни статус указали су на разлике у броју гојазних и хипертоничних особа између ове две групе испитаника. Иако није било разлике у вредностима *sICAM*-а, нивои *sVCAM*-а код ВТ-НС били су значајно виши него код СР-ДС и пре и након посла.

Закључак Седентарни и сменски рад имају синергистички ефекат на смањење радне способности и промовишу развој КВБ модификацијом традиционалних фактора ризика.

Кључне речи: седентарни начин рада; рад у сменама; радна способност; гојазност; хипертензија

INTRODUCTION

The World Health Organization (WHO) has recognized the improvement of working conditions and working environment as one of the strategic objectives of public health, promoting and maintaining the highest level of physical, mental and social well-being of workers in all occupations [1]. Due to the increased number of sedentary work positions nowadays, and given that a sedentary lifestyle is associated with multiple health problems - cardiovascular diseases (CVDs), obesity, diabetes mellitus, and early mortality [2, 3], work-related sedentary behavior is becoming an increasingly recognized problem in occupational medicine.

CVDs continue to be a major public health problem and a leading cause of morbidity and mortality globally. A recent meta-analysis showed that sedentary behavior increases the risk of fatal and non-fatal CVDs by 30%, and interestingly, a significantly higher risk of developing coronary heart disease (47%) compared to stroke (15%) was observed [4]. One plausible explanation is that sedentary behavior modulates traditional CVD risk factors such as increased body mass index (BMI), hypertension, elevated heart rate, and adiposity. However, sedentary behavior also leads to the dysfunction of vascular endothelium, which is a hallmark of the major CVD risk factors and early event during CVD development [2, 3, 5]. In particular, prolonged sitting has been shown to impair the normal hemodynamics of peripheral arteries, in terms of reduced blood flow and shear stress. Consequently, enhanced endothelial oxidative stress, accompanied by decreased nitric-oxide (NO) production, increased production of endothelin-1 (ET-1) and other pro-inflammatory mediators, leads to vascular dysfunction [6].

In addition to occupational sedentary behavior, shift work can also have several adverse effects on health, and most of the harmful effects were attributed to disruption of the circadian rhythm and consequent hypertension, dyslipidemia, insulin resistance, and obesity [3, 5], all known as CVD risk factors.

In the current study, we investigated the effects of occupational sedentary behavior and shift work on subjects' working ability and overall presence of morbidities. To determine how these two work modalities affect risk factors for CVD development, we analyzed subjects' clinical-anthropometric and laboratory-biochemical parameters, as well as the levels of soluble adhesion molecules, intercellular adhesion molecule-1 (sICAM-1) and vascular cell adhesion molecule-1 (sVCAM-1), as parameters of vascular dysfunction.

METHODS

Study population

The study enrolled 80 subjects, classified into 4 groups: day-shift taxi drivers (TD-DS) (n = 20), night-shift taxi drivers (TD-NS) (n = 20), day-shift sanitary workers (SW-DS) (n = 20), and night-shift sanitary workers (SW-NS) (n = 20). Study participants were recruited through periodical medical examinations at the Institute for Workers' Health Protection, Niš, Serbia, in the period from January to May 2024. All study participants were promptly informed about the relevant details concerning their participation in the study and gave written informed consent; the study was approved by the Ethical Committee. The main socio-demographic characteristics of the study groups are presented in Table 1.

Accordingly, the study groups were homogeneous in terms of age structure (H = 1.727, p = 0.631), gender (χ^2 = 6.154; p = 0.104), marital status (χ^2 = 8.390; p = 0.754), and the level of education (χ^2 = 11.403; p = 0.077). Also, there were no statistically significant differences between the groups regarding the years of total work experience (H = 1.11, p = 0.774) and the years of work experience at the current workplace (H = 4.81, p = 0.186).

Work Ability Index (WAI) Questionnaire

All study participants completed an anonymous self-report questionnaire regarding their work ability. In order to assess the impact of sedentary and shift work on participants' work ability, a standardized questionnaire, Work Ability Index (WAI) [7], was used. In addition to the WAI questionnaire, study participants were also asked to anonymously report their current occupation, age, total years of work experience, and length of service at their current workplace.

Anthropometric and clinical parameters

Anthropometric measurements included body weight, height, waist and hip circumference. A digital body scale with a stadiometer (SD301, Birotehna, Smederevo, Serbia) with a capacity of 250kg and an accuracy of 0.1kg was used to measure participants' body weight and height. BMI was calculated as the ratio of body weight (kg) to the square of body height (m^2). Waist circumference was measured using a non-stretch tape placed parallel to the floor at the midpoint between the iliac crest and the lowest rib. Hip circumference was measured around the widest portion of the buttocks. Based on the obtained values, the waist-to-hip and the waist-to-height ratio was calculated. Clinical parameters included measurement of systolic and diastolic blood pressure and heart rate. Blood pressure and heart rate were measured using the digital device M3 Comfort (Omron Healthcare, Kyoto, Japan), according to the manufacturer's instructions.

Laboratory-biochemical parameters

The subjects' blood was sampled by venipuncture of the medial cubital vein, before the start of the work shift and immediately after. Biochemical analyses included the hemogram, lipidogram, glycemia, and C-reactive protein. All analyses were carried out at the Institute for Workers' Health Protection, Niš, Serbia, according to a standardized protocol.

Serum levels of sICAM-1 and sVCAM-1 were determined by enzyme-linked immunosorbent assay (ELISA). Briefly, after blood sampling, 2mL of serum was separated, transported on ice to the Scientific Research Center for Biomedicine of the Faculty of Medicine, University of Niš

and stored at -80°C until analysis. Before analysis, samples were slowly thawed, mixed gently and then sICAM-1 and sVCAM-1 levels were determined using Human ICAM-1/CD54 Allele-specific Quantikine ELISA-Kit and Human VCAM-1/CD106 Quantikine ELISA-Kit (R&D Systems, Minneapolis, MN, USA), respectively. The optical density of the samples was read on Spark Multimode Plate Reader (Tecan Trading AG, Männedorf, Switzerland) at a wavelength of 450nm. sICAM-1 and sVCAM-1 concentrations (ng/mL) were calculated using software TableCurve 2D v5.0 (Grafiti LLC, Palo Alto, CA, USA).

Statistical analysis

Statistical parameters were collected in the Microsoft Office Excel 2013 (Microsoft, Redmond, WA, USA) while data analysis was performed using the statistical software SPSS v22 (IMB, Richmond, VA, USA). Descriptive statistics included standard statistical methods for qualitative and quantitative assessment of the obtained parameters. Absolute numbers, relative numbers (%), arithmetic mean ($\bar{x}$), standard deviation (SD), median, minimum and maximum values were used as measures of central tendency. The normality of the data set distribution was tested with the Shapiro-Wilk test. The comparison of numerical values between four groups of study participants, if the distribution was normal, was performed using the ANOVA test and Tukey's honestly significant difference (HSD) test for post-hoc analyses. In the case when the datasets were non-normally distributed, the Kruskal-Wallis test was used followed by post-hoc Dunn's test using a Bonferroni correction for multiple comparisons. Comparison of numerical values between two groups if the data distribution was normal was performed using a paired Student's t-test. In cases where the distribution was not normal, the Mann-Whitney test was used. The chi-square test was used to test the statistical significance of absolute frequency differences between samples. Pearson's correlation coefficient was used to determine the association between variables. A p-values < 0.05 were considered statistically significant.

Ethics: The study was approved by the Ethics Committee of the Faculty of Medicine, University of Nis, Serbia (number: 12-16502/2-8, date: 21.12.2023).

RESULTS

Effects of sedentary and shift work on work ability

The work ability index of the study participants by items and its correlations with age, total years of service, and years of service at the current workplace are shown in Figure 1.

The study groups didn`t differ significantly in terms of particular items of the work ability questionnaire (Figure 1A). However, in the item WAI3, which concerns the number of current diseases diagnosed by a physician, it was observed that hypertension is significantly more common among TD-NS compared to SW-DS ($p = 0.002$, $\chi^2 = 9.231$). Also, TD-NS were significantly more obese compared to SW-DS ($p = 0.008$, $\chi^2 = 7.059$). Although there were no significant differences in the scores of WAI items, the overall WAI score differed significantly between the study groups ($p = 0.009$, $h = 11.552$). Post-hoc comparisons indicated that TD-NS had significantly lower WAI scores than SW-DS ($p = 0.002$, $z = 3.061$) (Figure 1B). Correlation analyses showed that the total WAI score was negatively correlated with age and total years of work experience in all study groups; however, a negative correlation with years of work at the current workplace was observed only in the group of TD-NS and SW-NS. Conversely, the WAI3 score was negatively correlated with age and years of work at the current job only in taxi drivers (Figure 1C).

Effects of sedentary and shift work on anthropometric and clinical parameters

As observed in WAI3, anthropometric measurements showed that TD-NS were significantly more obese than SW-DS, according to increased body weight ($p = 0.001$, $z = 3.249$), BMI ($p < 0.001$, $z = 3.436$), waist circumference ($p < 0.001$, $z = 3.722$), waist-to-hip ($p < 0.001$, $z = 3.636$) and waist-to-height ratio ($p < 0.001$, $z = 3.718$). TD-DS also had significantly higher body weight ($p = 0.005$, $z = 2.817$), BMI ($p = 0.008$, $z = 2.654$), waist circumference ($p < 0.01$, $z = 3.065$), waist-to-hip ($p < 0.005$, $z = 2.832$) and waist-to-height ratio ($p < 0.005$, $z = 2.787$) compared to SW-DS. There were no statistically significant intergroup differences in the monitored clinical parameters, including heart rate and systolic and diastolic blood pressure (Figure 2A).

In general, anthropometric parameters of obesity showed a tendency to positively correlate with the age and total work experience of the study subjects, which sporadically reached the level of statistical significance. However, only in the group of TD-NS, there was a constant positive correlation between years of work experience at the current workplace and obesity parameters, except for waist circumference (Figure 2B).

Effects of sedentary and shift work on laboratory-biochemical parameters

The values of biochemical parameters in the blood differed significantly between the studied groups (Figure 3).

High-density lipoprotein (HDL) levels of TD-NS were significantly lower than those of SW-DS, both before ($p < 0.001$; $z = 3.665$) and after ($p < 0.001$; $z = 3.689$) the work shift. TD-NS also had significantly higher low-density lipoprotein (LDL) levels compared to SW-DS before the start of the shift ($p = 0.004$; $q = 4.942$). After the shift, LDL levels in this subject group were higher in comparison to TD-DS ($p = 0.004$; $z = 2.869$) as well as SW-DS ($p < 0.001$; $z = 3.647$) and SW-NS ($p < 0.001$; $z = 3.328$). A similar trend was observed for triglycerides. Both TD-NS ($p = 0.001$; $z = 3.198$) and TD-DS ($p = 0.006$; $z = 2.749$) had increased levels of triglycerides compared to SW-DS before starting the shift. The same was observed after the shift had ended ($p < 0.001$; $z = 3.668$ and $p = 0.002$; $z = 3.106$, respectively). No significant changes were recorded in the levels of the tested parameters before and after the shift within the same group of subjects (Figure 3).

Considering that the most significant differences in the biochemical parameters of the study participants were determined in the lipid profile, we correlated them with the characteristics of the participants' work engagement (Figure 4). A significant positive correlation between years of experience at the current workplace and levels of total cholesterol, LDL, and triglycerides was observed only in the group of TD-NS. In the group of TD-DS, a positive correlation was noted between age and total length of service with levels of total cholesterol, LDL, and triglycerides, mainly after the end of the shift.

Effects of sedentary and shift work on vascular dysfunction

The function of the subjects' vascular epithelium was assessed by the levels of soluble adhesion molecules, sICAM and sVCAM.

Levels of sICAM did not differ significantly between study groups before ($p = 0.279$; $h = 3.843$) and after the shift ($p = 0.695$; $h = 1.444$), nor were there significant differences between sICAM levels before and after the shift within the same group (Figure 5A). In general, sICAM levels were positively correlated with most anthropometric parameters of obesity in all study groups except for SW-DS (Figure 5B).

In contrast, sVCAM levels of TD-NS were significantly higher than those of TD-DS and SW-DS both before ($p = 0.005$; $z = 2.830$ and $p = 0.002$; $z = 3.103$, respectively) and after the shift ($p = 0.008$; $z = 2.660$ and $p = 0.004$; $z = 2.871$, respectively) (Figure 6A). Similar to sICAM levels, sVCAM levels did not differ significantly before and after the shift within the same study group (Figure 6A).

The levels of sVCAM were positively correlated with age in all study groups. In most groups, sVCAM levels were also positively correlated with years of total work experience and years of service at the current job. Similar to sICAM, sVCAM was positively correlated with anthropometric parameters of obesity in all study groups except for the SW-DS. In addition, a significant positive correlation of sVCAM with cholesterol, LDL, and triglyceride levels was observed in the group of TD-NS (Figure 6B).

DISCUSSION

During working hours, sanitary workers are constantly physically active, unlike taxi drivers, whose occupation is extremely sedentary. Therefore, we examined how these two work modalities affect the work ability and health status of workers, taking into account the shift work.

Our study showed that TD-NS had significantly lower work ability, measured by the total WAI score, compared to SW-DS, indicating that sedentary and shift work have cumulative effects in reducing work ability. Sedentary behavior is associated with loss of skeletal muscle mass, strength, and the development of various metabolic diseases and CVDs [8], which may contribute to the reduction of the total WAI score. In our study, scores of WAI3, which refers to the current health status of study participants, were negatively associated with length of service at the current job only among taxi drivers, indicating that sedentary work primarily affects work ability by compromising the health status of workers. Accordingly, there was a significantly higher number of obese and hypertensive individuals in the group of TD-NS compared to SW-DS. This finding isn`t surprising considering that obesity is an independent risk factor for the development of hypertension as well as other CVDs [8]. Numerous other studies have also linked sedentary and shift work to an increased risk of CVDs development [9, 10]; however, the precise mechanisms underlying this association are still not well understood. A recent study showed that there was a slightly higher rate of CVDs, diabetes and unhealthy sleep status among shift workers in comparison to non-shift workers, as well as among night-shift workers compared to those who haven`t been working night shifts [3]. To determine how sedentary and shift work modify traditional risk factors for CVDs, we examined anthropometric, basic clinical, and laboratory parameters of our subjects, as well as the levels of soluble adhesive molecules (sICAM and sVCAM) as markers of endothelial dysfunction.

Anthropometric parameters confirmed the findings of WAI3, showing that both TD-NS and TD-DS were more obese than SW-DS, according to body weight, BMI, waist circumference, waist-to-hip and waist-to-height ratio. These results indicate that sedentary work has a greater

impact on physical fitness than shift work, reducing energy expenditure and regular daily activities, which over time leads to an increase in body weight. These findings are supported by a study that shows the association of sedentary behavior and increased value of obesity predictive biomarkers [11]. Most obesity parameters were positively correlated with years of work experience at the current workplace only in the group of TD-NS, again suggesting cumulative effects of these two work modalities. Basic clinical parameters, including systolic and diastolic blood pressure and heart rate, didn`t differ significantly between groups. In WAI3, a higher number of hypertensive patients was documented in the group of night shift taxi drivers, but blood pressure values did not differ from the other groups. This can be explained by the fact that hypertensive patients were medically evaluated and therefore adequately treated.

Among the laboratory parameters, the most pronounced alterations were documented in the participants' lipid profile. Night-shift taxi drivers had increased total cholesterol, LDL and triglyceride values, and lower HDL levels compared to SW-DS, both before and after the shift. Additionally, TD-DS also had increased values of LDL and triglycerides compared to SW-DS. Together, these results indicate an association between sedentary work and dyslipidemia, which is even more pronounced if the work is performed in shifts. Observed alterations of lipid profile are typical for obesity and associated with a higher risk for the development of CVDs [12]. Among TD-NS, a positive correlation was recorded between total cholesterol, LDL and triglyceride levels and years of work at the current job, both before and after the shift. Taking this into account and the fact that there were no significant differences in lipid parameters within each group before and after the shift, it can be concluded that the effects of sedentary and shift work on lipid status are chronic in nature.

The main cause of most CVDs is atherosclerosis, characterized by inflammation and dysfunction of the vascular endothelium. One of endothelial dysfunction features is the up-regulation of cell adhesion molecules, such as ICAM-1 and VCAM-1, physiologically involved in leukocyte recruitment [13]. Accordingly, higher plasma levels of ICAM and VCAM have been documented in patients suffering from hypertension, atherosclerosis, coronary heart disease, left atrial and left ventricular systolic dysfunction [14, 15, 16]. Levels of sICAM didn`t significantly differ among our study participants, but they tended to correlate positively with obesity parameters (BMI and waist-to-height ratio) in all groups except SW-DS, who had the smallest BMI ($24.64 \pm 2.01$), and generally weren`t obese. The association between obesity and endothelial dysfunction is well-established [17]. In contrast to sICAM, sVCAM levels were elevated in the group of TD-NS compared to TD-DS and SW-DS, both before and after the shift. The levels of

sVCAM were more strongly correlated with almost all obesity parameters except in SW-DS group. Furthermore, a positive correlation was observed with total cholesterol, LDL, and triglyceride levels in the group of TD-NS, indicating that sVCAM is a more sensitive marker of endothelial dysfunction associated with obesity than sICAM. No differences in sICAM and sVCAM levels were observed before and after the shift in all study groups, suggesting that sedentary and shift work also have primarily chronic effects on endothelial dysfunction. Accordingly, the strongest correlation between sVCAM levels and years of service at the current workplace was observed in the group of TD-NS. Other studies have also indicated the detrimental effects of sedentary behavior and shift work on endothelial function, however, in these studies, the level of endothelial dysfunction was evaluated by the flow-mediated vasodilatation technique [5, 18]. This can be considered the main advantage of our study, because we used sICAM and sVCAM which aren`t only parameters of endothelial dysfunction, but also directly involved in the pathogenetic mechanisms linking sedentary and shift work to the CVD development [19]. Levels of sVCAM were also positively correlated with age in all groups, indicating a progressive decline in endothelial function during senescence, consistent with other studies [20] and the fact that the incidence of CVD is significantly higher in the older population [21].

CONCLUSION

Our study showed that sedentary and shift work have synergistic effects in reducing work ability, which may be associated with an increased incidence of CVDs. We have shown that these work modalities together promote obesity, dyslipidemia, and endothelial dysfunction, as traditional risk factors for CVDs development. Increased frequency of sedentary and shift work in modern society should motivate managers, in collaboration with occupational medicine specialists, to consider ways to mitigate the harmful effects of such work on their employees. Possible solutions include increasing physical activity during working hours and changing dietary habits as cost-effective strategies.

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Table 1. Socio-demographic characteristics of the study participants

Characteristics		Day-shift taxi drivers	Night-shift taxi drivers	Day-shift sanitary workers	Night-shift sanitary workers	p
Age	Years (mean ± SD)	40.25 ±7.85	38.3 ± 7.96	37.95 ± 7.86	37 ± 9.32	0.631[1]
Gender	male n (%)	16 (80)	19 (95)	13 (65)	17 (85)	0.104[2]
	female n (%)	4 (20)	1 (5)	7 (25)	3 (5)	
Marital status	married n (%)	9 (45)	7 (35)	10 (50)	7 (35)	0.754[2]
	single n (%)	5 (25)	6 (30)	2 (10)	8 (40)	
	informal relationship n (%)	2 (10)	3 (15)	1 (10)	2 (10)	
	Separated n (%)	1 (5)	2 (10)	3 (15)	2 (10)	
	Divorced n (%)	3 (15)	2 (10)	4 (20)	1 (5)	
Level of education	primary n (%)	2 (10)	3 (15)	6 (30)	8 (40)	0.077[2]
	Secondary n (%)	15 (75)	16 (80)	14 (70)	12 (60)	
	Tertiary n (%)	3 (15)	1 (5)	0 (0)	0 (0)	
Total years of service	Years (mean ± SD)	16.20 ± 8.13	14.90 ± 7.99	14.65 ± 8.81	13.55 ± 9.01	0.774[1]
Years of service at the current workplace	Years (mean ± SD)	6.2 ± 2.63	5.45 ± 2.5	8.5 ± 5.83	8.75 ± 5.42	0.186[1]

[1]Kruskal–Wallis test;

[2]χ^2 test

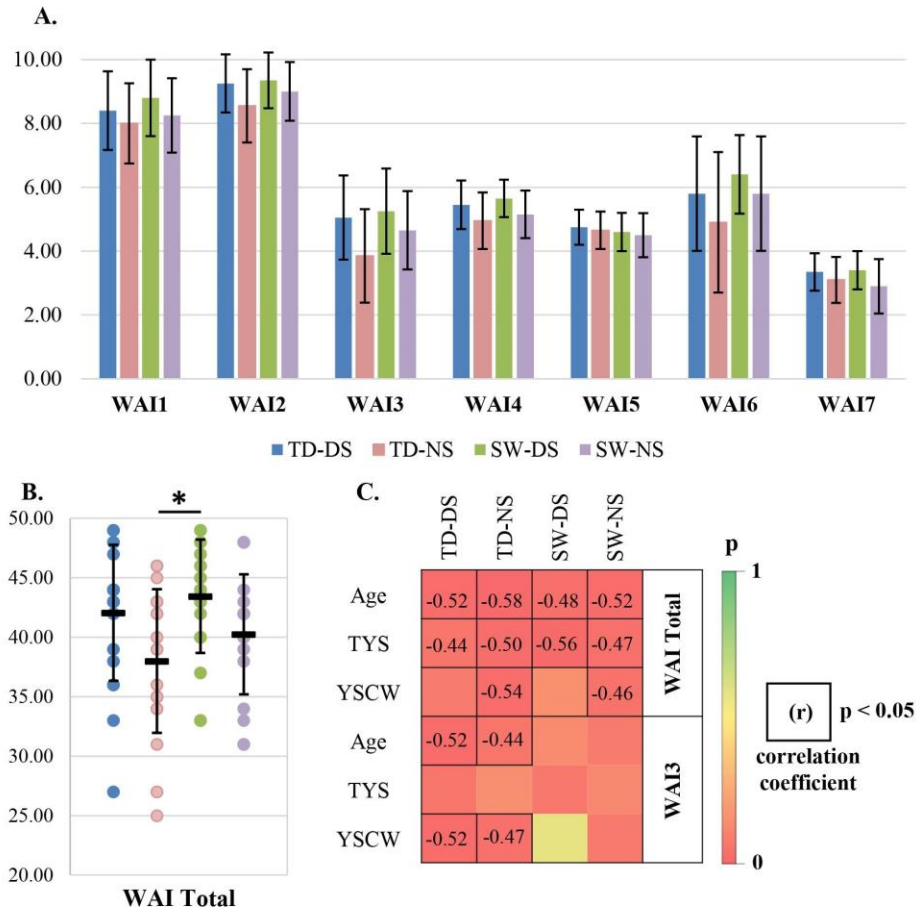

Figure 1. Work ability index (WAI) of study participants: A. individual WAI item scores; B. total WAI score, and C. correlation analyses;

TD-DS – taxi drivers day shift; TD-NS – taxi drivers night shift; SW-DS – sanitary workers day shift; SW-NS – sanitary workers night shift; TYS – total years of service; YSCW – years of service at the current workplace

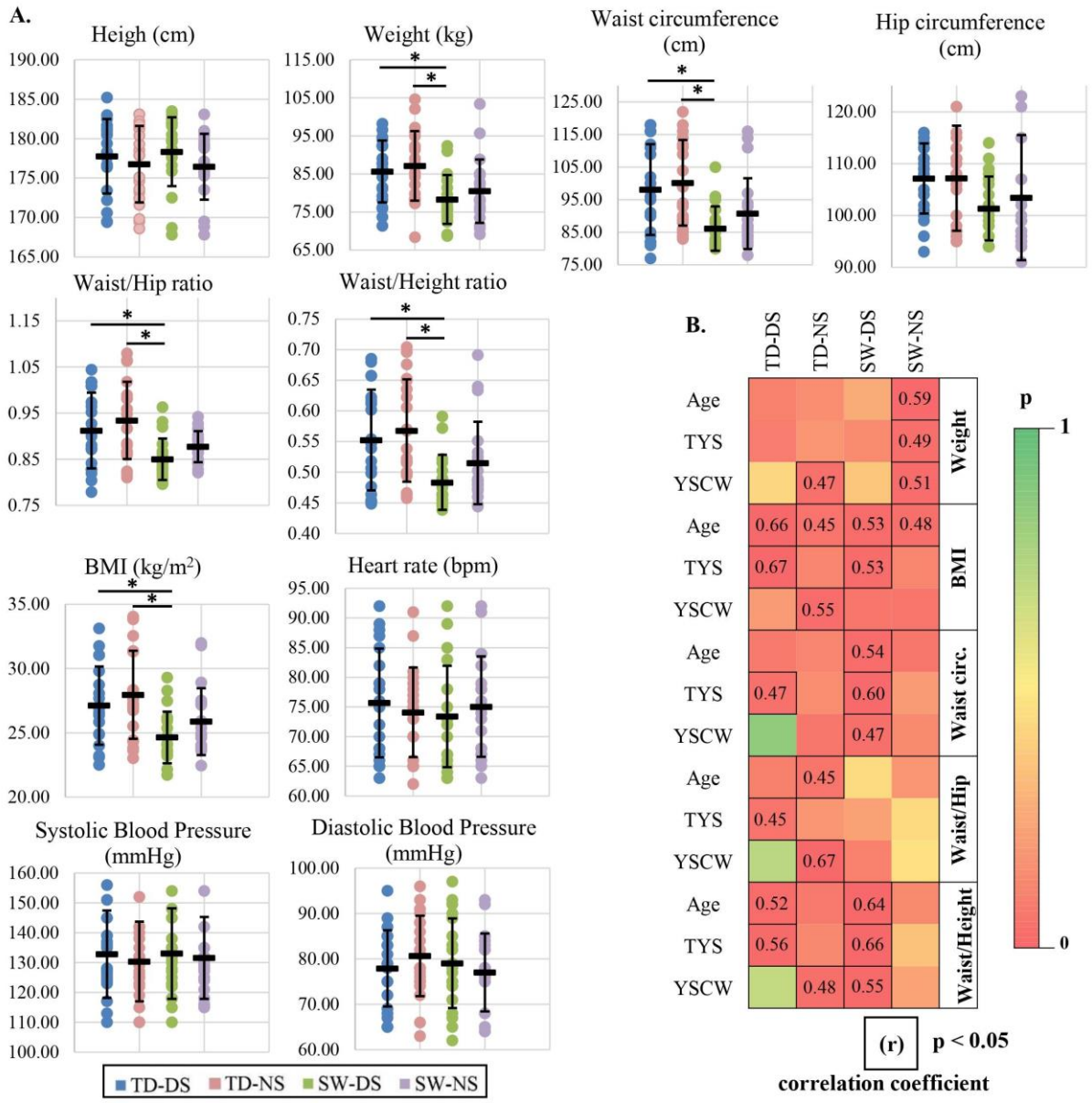

Figure 2. Anthropometric and clinical parameters of study participants: A. statistically significant differences and B. correlation analyses;

TD-DS – taxi drivers day shift; TD-NS – taxi drivers night shift; SW-DS – sanitary workers day shift; SW-NS – sanitary workers night shift; BMI – body mass index; TYS – total years of service; YSCW – years of service at the current workplace

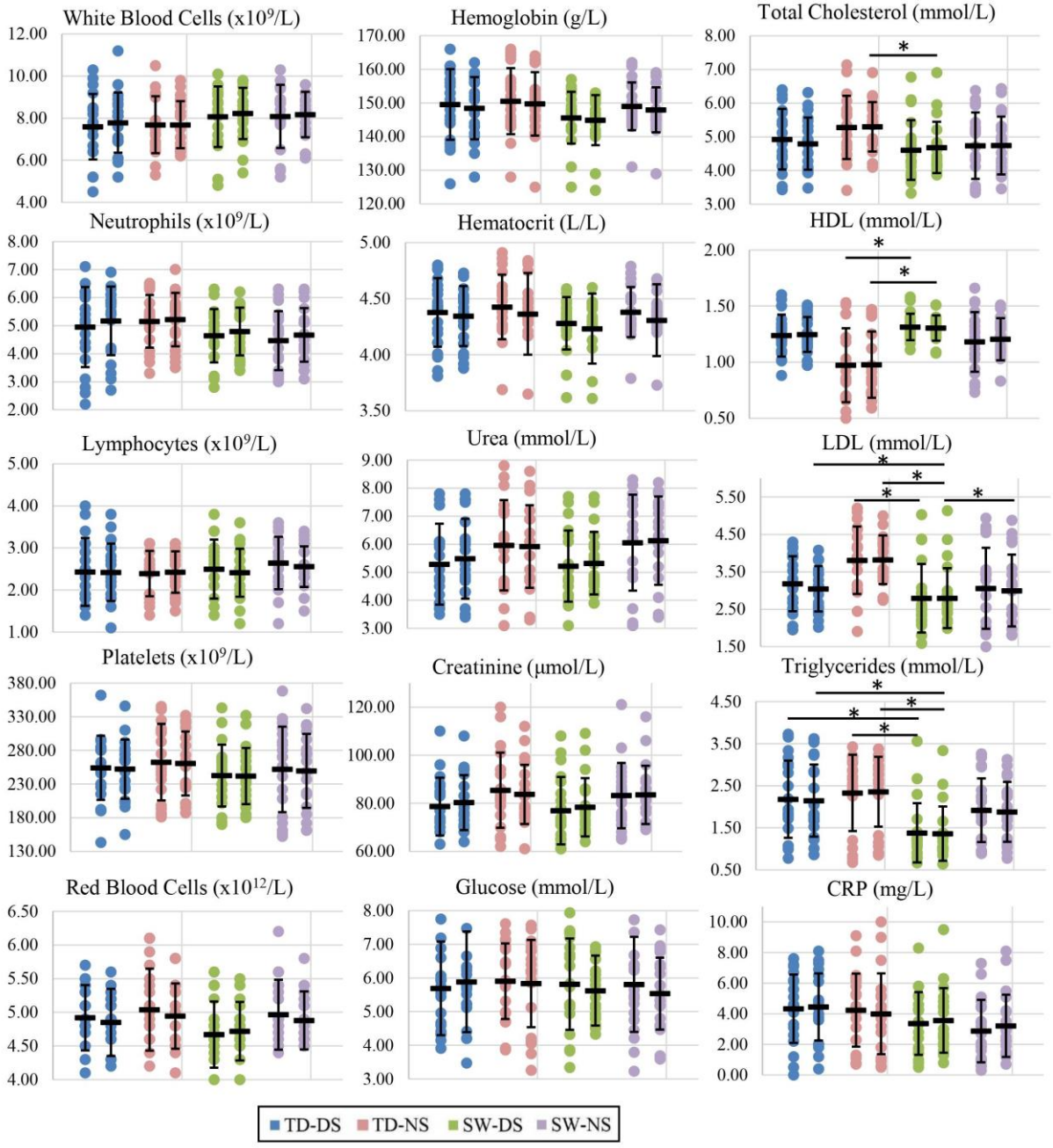

Figure 3. Biochemical parameters of study participants before (first column) and after (second column) work shift;

TD-DS – taxi drivers day shift; TD-NS – taxi drivers night shift; SW-DS – sanitary workers day shift; SW-NS – sanitary workers night shift; HDL – high-density lipoprotein; LDL – low-density lipoprotein; CRP – C-reactive protein

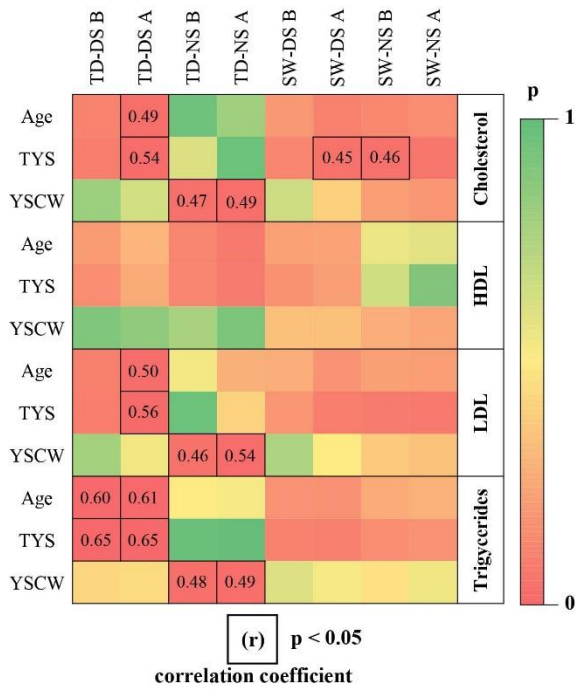

Figure 4. Correlation analysis of the lipid profile of study participants with the characteristics of their work engagement;

TD-DS – taxi drivers day shift before (B) and after (A) the shift; TD-NS – taxi drivers night shift before (B) and after (A) the shift; SW-DS – sanitary workers day shift before (B) and after (A) the shift; SW-NS – sanitary workers night shift before (B) and after (A) the shift; TYS – total years of service; YSCW – years of service at the current workplace; HDL – high-density lipoprotein; LDL – low-density lipoprotein

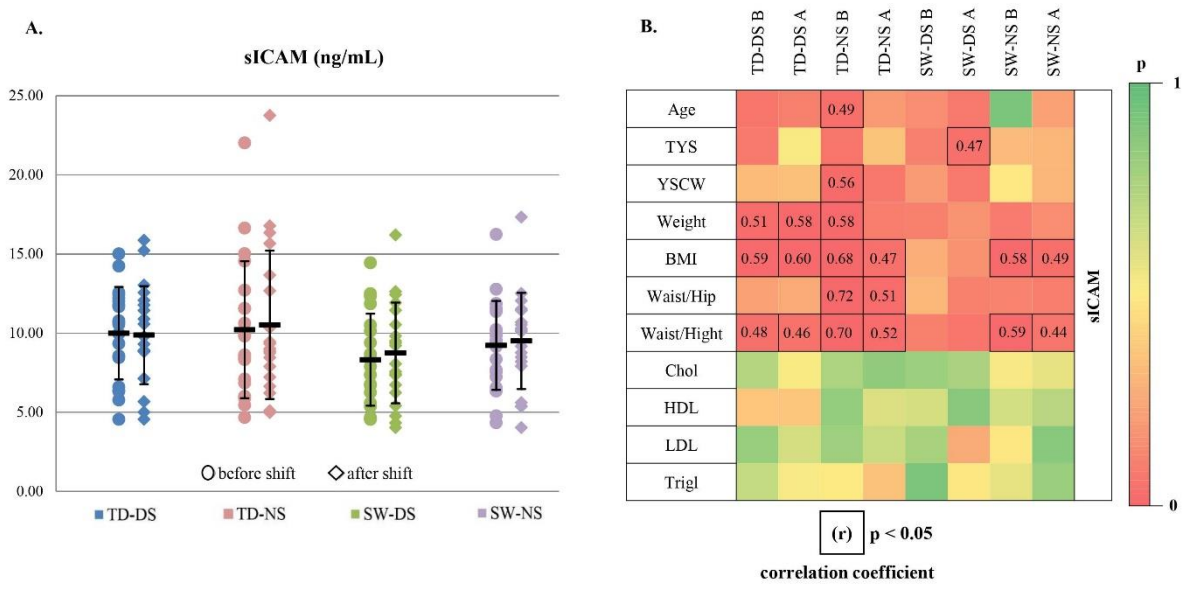

Figure 5. sICAM levels of study participants: A. statistically significant differences and B. correlation analyses;

TD-DS – taxi drivers day shift before (B) and after (A) the shift; TD-NS – taxi drivers night shift before (B) and after (A) the shift; SW-DS – sanitary workers day shift before (B) and after (A) the shift; SW-NS – sanitary workers night shift before (B) and after (A) the shift; TYS – total years of service; YSCW – years of service at the current workplace; BMI – body mass index; Chol – cholesterol; HDL – high-density lipoprotein; LDL – low-density lipoprotein; Trigl – triglycerides

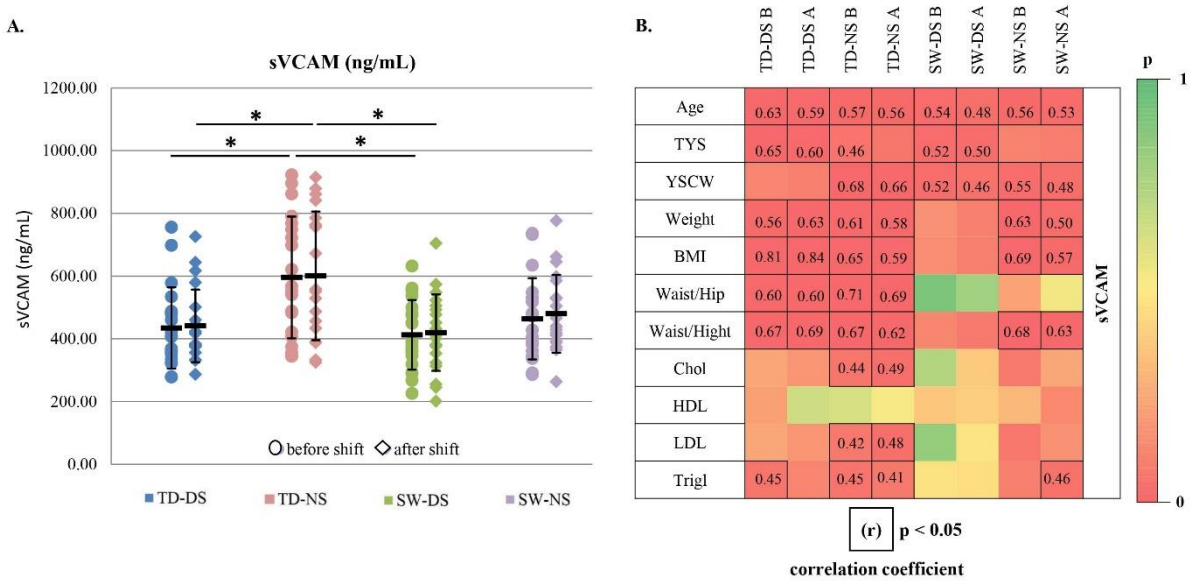

Figure 6. sVCAM levels of study participants: A. statistically significant differences and B. correlation analyses;

TD-DS – taxi drivers day shift before (B) and after (A) the shift; TD-NS – taxi drivers night shift before (B) and after (A) the shift; SW-DS – sanitary workers day shift before (B) and after (A) the shift; SW-NS – sanitary workers night shift before (B) and after (A) the shift; TYS – total years of service; YSCW – years of service at the current workplace; BMI – body mass index; Chol – cholesterol; HDL – high-density lipoprotein; LDL – low-density lipoprotein; Trigl – triglycerides

