



# Stress at intellectual work and cardiovascular diseases in women at non-mobility working age

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A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical revision of the article, F – Final approval of article

Raczkiwicz D, Bojar I, Wdowiak A, Rzeźnicki A, Krakowiak J. Stress at intellectual work and cardiovascular diseases in women at non-mobility working age. *Ann Agric Environ Med*. 2019; 26(3): 456–461. doi: 10.26444/aaem/105142

## Abstract

**Introduction and objective.** Stress at the work place reduces efficiency, as well as increasing accidents and absences, which may cause various diseases, including cardiovascular diseases. The aim of the study is an analysis of the prevalence and causes of stress in intellectual work, and its correlation with the prevalence of cardiovascular diseases in women at non-mobility working age.

**Materials and method.** The study was conducted in 2016–2017 in a group of 300 women aged 45–60 in non-manual employment. A questionnaire for subjective job evaluation was used. Logistic regression models for the occurrence of CVDs versus frequency of occurrence of individual causes of work stress among the respondents were estimated.

**Results.** Women at non-mobility working age with non-manual employment are especially exposed to stress, half of them experience high level of stress at work, most often caused by social contacts and lack of rewards and support. Cardiovascular diseases were found in 26.5% of the women studied who were also significantly higher exposed to the occurrence of health hazards due to exposure to harmful factors, or due to an accident at work, changes in the workplace, the need to compete with others, and the need to perform the task despite the lack of appropriate material resources, compared with women without such diseases.

**Conclusions.** The study revealed a high prevalence of occupational stress in non-manual employment, indicated its main causes that correlated with the absence of cardiovascular diseases. Actions are needed to reduce the level of stress in the work of women at non-mobility working age, to maintain their work ability and quality of life.

## Key words

stress at work, cardiovascular diseases, non-mobility working age

## INTRODUCTION

In any human being, stress may cause a disease and suffering in any environment, both at work and at home. There can be various sources of stress such as emotional tension related to work [1]. Worsening of a psychological state of an individual taking the form of fear, anger and depression has a negative impact on effectiveness at work and, in consequence, on financial results. It has been proved that the efficiency of workers is lowered, there is an increase in the number of accidents and absences at work, which is translated precisely into financial results. It is apparent from research that the cost of stress at work related only to psychological problems in European Union countries is estimated at over 265 trillion Euros *per annum* [2].

One of the most popular psychological concepts of stress assumes that the stress is a result of a certain transaction taking place between the environment and inner convictions of an individual, which concern the ability of this individual to deal with a given situation. During a stressful situation, the secretion of glucocorticoids, particularly cortisol, increases significantly [3]. From the perspective of the organism, this

activity is highly adaptive and prepares the organism for a reaction to a potentially threatening stimulus. Despite the benefits of transitory stress when it comes to the individual's ability to manage a difficult situation, contemporary studies show that the negative impact of stress appears when it is long-term, mostly due to the fact that it then causes a lasting and ultimately exhausting state of alertness for the organism [4]. One of the models of stress related to work assumes that it results from three components: high expectations towards a worker, low sense of control and low social support [5]. These factors are of a relatively long-lasting character which is rather independent of the individual, and repeatedly results from the structure of the organisation itself. Thus, it is legitimate to assume that stress related to a workplace may be of a long-lasting character, and the activities of an individual towards minimising it are difficult.

If the changes described above occur with high frequency and are sustained for a longer period of time, they must lead to disorders in various systems of the organism, particularly those most sensitive in a given individual, due to genetic reasons or previous illnesses. The period that may play a relevant role in adaptive disorders of the organism leading to a high level of stress is the pre-menopausal period in women. The decrease in the production of oestrogens results in their less protective activity in the circulatory system [6, 7].

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Received: 07.02.2019; accepted: 18.02.2018; first published: 08.03.2019

Epidemiological research during the last 20 years has shown that cardiovascular diseases (CVDs) are the most common causes of demise in Poland. Around 50% of all deaths are caused by these diseases, and the leading role is played by ischemic heart disease and hypertension. This translates to a huge economic burden caused by the constantly increasing expenditure needs that are related to healthcare and costs related to absenteeism. One of the risk factors of the adverse changes in the circulatory system is exposure to stress. There have been many studies that presented exposure to stress related to work, finance, or a family situation, significantly increases the risk of occurrence of cardiovascular diseases. Additionally, attention has been paid to the higher risk of health consequences in women exposed to stress as opposed to men [8, 9]. Although the main emphasis in the study was placed on the aetiology of cardiovascular diseases, there is evidence that transfers the weight of the role of stress in the progress of an illness in people endangered with CVDs, and those who have previous incidences of such an illness [10].

The aim of the article is to study the frequency of occurrence and reasons for stress while performing mental work, and its relation to the frequency of occurrence of CVDs in women at non-mobility working age, i.e. from 45 years of age to retirement.

## MATERIALS AND METHOD

The study was conducted in 2016–2017. Women who qualified for the study were at non-mobility working age, i.e. aged 45 – 60, who were all employed as mental workers in the Lublin Province in Eastern Poland. Socio-demographic data, as well as information concerning the occurrence of CVDs and the stress at work test were collected using a survey.

Two groups of women were distinguished, one with CVDs, 76 (26.5%) and one without CVDs (211, i.e. 73.5%). Among the respondents with CVDs, 67 (23.3%) of the total number suffered from hypertension, eight (2.8%) had a coronary disease and 5 (1.7%) of the total number had some other kind of a cardiovascular disease. Three of the respondents had both hypertension and a coronary disease.

Informed consent for participation in the study was obtained from all the women. A similar consent for the study was obtained from the Ethical Commission at the Institute of Rural Health in Lublin, Poland.

In order to evaluate stress at work, a questionnaire for subjective job evaluation was used [11] which is a universal tool applied regardless of the post held or duties performer, it is also standardized with Polish norms. It serves to recognize stressful work features and people whose health is exposed to excess stress. The mutual aim is primary prevention, i.e. removing causes of stress from the workplace.

A questionnaire for subjective job evaluation comprises of 64 statements which describe various work features. The respondent marks the level of onerousness of each feature using a 5-step scale:

- 1) the feature does not occur, does not concern my workplace;
- 2) the feature occurs but does not bother me nor does it irritate me;
- 3) it irritates me or bothers me sometimes;
- 4) it irritates or bothers me quite often;
- 5) it constantly irritates me at work, I even get irritated because of that at home.

On this basis, a global index of stress (low, medium or high) is calculated as well as 10 causes of stress at work.

**Statistical analysis.** Statistical analysis of data was performed in SPSS statistical software. For qualitative variables, such as level of education, place of residence, marital status, global stress index, 10 groups of causes, the absolute numbers (number of occurrences of individual variants, features (n) and percentages (ratio of the number of individuals in a given variant of a feature to the sample size expressed in %) were calculated. For age and the frequency of stress causes at workplace, arithmetic means (M) and standard deviations (SD) were calculated.

Qualitative features were compared between women with and without CVDs using a square chi test, whereas quantitative features using the t test of the difference between two means in independent samples, was applied. Logistic regression models for the occurrence of CVDs versus frequency of occurrence of individual causes of work stress among the respondents were estimated. The Tables also show the odds ratios. The value of  $p < 0.05$  was considered as a significant difference.

## RESULTS

The respondents with CVDs were, on average,  $53.5 \pm 4.4$  years old and those without CVDs, on average, were  $52.6 \pm 4.5$  years old. There were no significant differences between women with and without CVDs regarding age, level of education, place of residence and marital status ( $p > 0.05$ ) (Tab. 1).

A high level of stress was found in about half of the respondents (49.3% without CVDs and 47.4% with CVDs). Medium level of stress was presented by about a third of the respondents, whereas low in 17.5% of the respondents without CVDs and in 15.8% with CVDs (Tab. 2). General stress level at work did not differ significantly between women with and without CVDs ( $p > 0.05$ ).

The most frequent causes of stress in the respondents, both with and without CVDs, were social contacts and lack of rewards and support (about 50% of respondents), slightly less frequent were a sense of psychological burden related to the complexity of the work, and a sense of insecurity caused by the organization of work (about 40% of respondents), which was followed by even more rare factors – no control and a sense of responsibility (about every third examined woman), with the rarest being physical onerousness, a sense of danger and unpleasant working conditions (fewer than 20% of the respondents) (Fig. 1). There were no significant differences between women with and without CVDs regarding the ten causes of stress in a workplace ( $p > 0.05$ ).

Stress at work most frequently concerned the fact that the respondents could not stop thinking about work, they had too many duties to perform, they were treated unfairly and were underappreciated at work, could not rely on their bosses, they had a feeling of insecurity, they had to go from one task to another, they were surprised by their tasks, they were expected to work under time pressure, there were changes at the workplace, they had to arrive and leave work at a certain time (average stress level above 2) (Tab. 3).

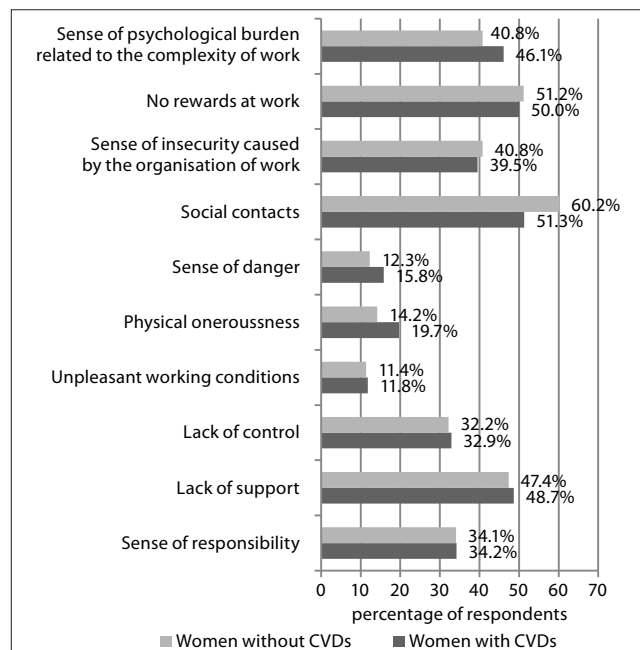
The odds of CVDs occurrence was evaluated considering the frequency of stress occurrence at workplaces of the respondents (Tab. 3). Women who were more often stressed

**Table 1.** Characteristics of the respondents

Variable	Categories	Parameter	Women with CVDs	Women without CVDs	Significance of differences	
					test	p
Age	Years(?)	<i>M±SD</i>	53.5±4.4	52.6±4.5	<i>t</i> =1.559	0.120
Level of education	primary	n (%)	0 (0.0)	1 (0.5)	$\chi^2$ =3.104	0.376
	basic vocational		5 (6.6)	6 (2.8)		
	high school		26 (34.2)	64 (30.3)		
	university		45 (59.2)	140 (66.4)		
Place of residence	a big city (over 100 thousand citizens)	n (%)	56 (73.7)	126 (59.7)	$\chi^2$ =5.379	0.068
	a small city (up to 100 thousand citizens)		9 (11.8)	48 (22.7)		
	village		11 (14.5)	37 (17.5)		
Marital status	married	n (%)	53 (69.7)	167 (79.1)	$\chi^2$ =6.237	0.182
	single		10 (13.2)	11 (5.2)		
	divorced		9 (11.8)	19 (9.0)		
	widows		3 (3.9)	9 (4.3)		
	separated		1 (1.3)	5 (2.4)		

**Table 2.** Global results of stress evaluation in respondents

Level of stress	Parameter	Women with CVDs	Women without CVDs	Significance of differences	
				$\chi^2$	p
low		12 (15.8)	37 (17.5)		
medium	n (%)	28 (36.8)	70 (33.2)	0.362	0.834
high		36 (47.4)	104 (49.3)		

**Figure 1.** Groups of causes of stress at work in the respondents

by the occurrence of health hazard due to being exposed to harmful substances or because of an accident at work, were more likely to develop cardiovascular diseases by 35.0%, on average. Women who were more frequently stressed by changes at workplaces were more likely to develop such diseases by 23.2%, on average. Women who were stressed by the fact that they had to perform their duties despite having no material means to do so (such as tools, materials, money, etc.) were more likely to develop CVDs by 27.3%, on average.

Women who were more stressed by the necessity to compete with others had a chance of developing such a disease greater by 25.2%, on average.

## DISCUSSION

Since the majority of people at productive age spend about half of their working day at a workplace, it plays a great role in promoting health and well-being. There are various national and international bodies which are responsible for providing safety and hygiene of work, with particular emphasis placed on identifying physical, chemical and biological hazards. It happens more and more often that attention is paid to the psycho-social aspects of a workplace, particularly to stress at a workplace.

Results of research show that stress as a risk factor for the circulatory system may have a greater importance for women rather than men [12]. Thus, any activities aimed at reducing the exposure to stress in women at their workplaces are of particular significance, and may contribute to lowering morbidity related to the circulatory system in the whole population.

The results of analyses of the presented study show that stress accompanied most of the respondents at their work. In over a half of them a high level of stress was discovered, whereas in every third of the respondents the stress level was established as medium. It was also observed that a number of stress factors at a workplace made a significant contribution to the development of cardiovascular diseases in the respondents. The stressors that most significantly increased the risk of CVDs occurrence were as follows: regular changes in the manner and technique of performing tasks, performing a task despite the lack of appropriate material means (tools, materials, money, etc.), persistent sense of risk of losing a job, and health hazard resulting from being exposed to harmful factors at a workplace or from an accident at work. The listed factors increased the risk of CVDs occurrence in the respondents by over 23%, over 27%, almost 31% and 35%, respectively.

The obtained results are consistent with those described in international literature, where it is estimated that the risk of

**Table 3.** Stress level at workplaces of the respondents

Factor	Reasons of stress at workplace	Women with CVDs		Women without CVDs		Significance of differences	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>OR</i>	<i>p</i>
Sense of psychological burden related to the complexity of work	Experiencing internal conflicts	1.9	1.4	1.8	1.1	1.076	0.499
	Taking work home	1.7	0.9	1.7	1.0	1.010	0.940
	Can't stop thinking about work	2.5	1.2	2.3	1.1	1.124	0.313
	Too many professional duties	2.1	1.1	2.1	1.2	0.995	0.967
	Performing tasks poses difficulties	1.9	1.0	1.8	1.0	1.113	0.420
	Working overtime	1.4	0.8	1.4	0.9	1.063	0.690
	Work has a negative influence on family life	1.7	1.1	1.6	1.0	1.069	0.588
	A sense of not performing a task	2.0	1.1	1.9	1.1	1.080	0.528
No rewards at work	Work pace not adjusted to the possibilities	1.6	1.0	1.7	1.1	0.885	0.358
	Low prestige of work	1.7	0.9	1.7	1.0	0.998	0.988
	Not using their abilities, qualifications	1.8	0.9	2.0	1.1	0.897	0.392
	Treated unfairly	2.3	1.3	2.2	1.3	1.034	0.743
	Whatever is done at work makes no sense	1.6	1.1	1.5	0.9	1.140	0.327
	Can't rely on the boss for their support	2.1	1.4	2.1	1.2	1.003	0.980
	Underappreciated at work	2.3	1.3	2.2	1.3	1.065	0.547
	Must perform duties despite the lack of means to do so	1.8	1.2	1.3	0.9	1.273	<b>0.048</b>
Sense of insecurity caused by the organisation of work	Has a sense of insecurity	2.2	1.2	2.1	1.1	1.106	0.392
	Must go from task to task	2.3	1.0	2.2	0.9	0.943	0.684
	Surprised by tasks	2.2	1.0	2.2	1.0	1.013	0.921
	Imposed pace of work	1.7	0.8	1.9	1.0	0.810	0.155
	Rush required	2.1	1.1	2.1	1.1	0.946	0.652
	Time pressure – impossibility of exceeding deadlines	2.0	1.1	2.2	1.1	0.811	0.103
	Work performed on impulses	1.7	0.9	1.8	1.1	0.914	0.502
Social contacts	Must reconcile many conflicts of interests	2.0	1.2	1.9	1.0	1.127	0.338
	Performing complex mental tasks	2.0	0.8	2.1	0.9	0.806	0.197
	There were changes at workplace	2.4	1.2	1.9	1.1	1.232	<b>0.049</b>
	Competing with others	1.6	0.6	1.2	1.0	1.252	<b>0.047</b>
	Necessity to co-operate with others	1.8	0.8	2.0	0.8	0.720	0.069
Sense of danger	Helping other people	1.7	0.7	1.8	0.8	0.910	0.581
	Conflicts and animosities	1.7	1.1	1.8	1.0	0.886	0.391
	Mistakes made lead to health and life hazard	1.3	0.7	1.4	0.8	0.887	0.510
	Dangers resulting from harmful factors or accidents	1.8	1.0	1.3	0.8	1.350	<b>0.032</b>
Physical onerousness	Availability	1.4	0.7	1.3	0.8	1.054	0.757
	Multi-shift work	1.1	0.6	1.1	0.5	1.107	0.680
	Great noise	1.3	0.8	1.3	0.8	0.908	0.599
	Poor lighting	1.5	1.0	1.3	0.8	1.251	0.125
	Confined space	1.3	0.7	1.3	0.8	1.019	0.915
Unpleasant working conditions	Inappropriate temperature	1.4	1.0	1.3	0.8	1.140	0.371
	Stench	1.2	0.6	1.1	0.5	1.190	0.431
	Dampness	1.1	0.5	1.1	0.4	1.183	0.557
Lack of control	Dirt	1.1	0.5	1.3	0.8	0.794	0.284
	Alertness required	2.0	1.0	2.0	1.0	0.983	0.896
	Repeating the same activities	1.8	0.9	1.8	0.8	1.026	0.871
	Must arrive and leave at a certain time	2.1	0.8	2.0	0.7	1.058	0.751
Lack of support	Breaks that are scheduled	1.2	0.5	1.2	0.6	0.936	0.776
	Absence causes disruption at work	1.7	1.1	1.8	1.1	0.895	0.381
	Work is performed alone	1.5	0.8	1.5	0.8	1.085	0.609
Sense of responsibility	Can't count on colleagues for support	1.8	1.0	1.7	1.0	1.047	0.719
	No information about the correctness of the work performed	1.8	0.9	1.9	0.9	0.943	0.684
	Financial responsibility	1.7	0.9	1.8	1.1	0.862	0.290
	It is easy to make a mistake that would have grave consequences	1.8	1.1	1.9	1.1	0.888	0.354
	Work is planned in detail by supervisors	1.7	0.7	1.7	0.9	1.017	0.918



CVDs occurrence is higher in workers exposed to stress at a workplace by about 10–40%, as opposed to workers among whom such a risk does not occur [13, 14, 15].

According to international research, stress at work does not only increase the risk of CVDs occurrence among workers, but – combined with low satisfaction from the performed work – is one of the main factors that decide about not returning to work after an illness [16, 17, 18, 19]. It also needs to be emphasized that cardiology rehabilitation programmes after an illness in people who are professionally active, does not include any educational elements devoted to the topic of managing stress at a workplace [20]. Also, the European Society of Cardiology draws attention to that fact of the importance for introducing educational programmes into the process of cardiology rehabilitation is [21].

The latest research show that having the ability to control emotions and to deal with stressful situations lowers the risk of CVDs occurrence in people exposed to stress [22]. Thus, it is immensely important to provide health education directed at psychological health among people who are professionally active, with particular attention paid to gaining practical abilities that allow dealing with critical situations. Elaborating and implementing educational activities that are efficient and based on good practices from other countries, may significantly contribute to lowering morbidity and mortality due to cardiovascular diseases in the whole population.

The results of research that are the point of interest of this study show that women with CVDs experienced stress at workplace more frequently due to the sense of psychological burden related to the complexity of work, a sense of danger, physical onerousness, and the lack of support from their employers.

The mentioned differences may result from the fact that an illness caused difficulties in functioning at a workplace, it may have caused the reduction of skills that help manage work overload and reduced the sense of autonomy at a workplace. Furthermore, it is more difficult for the employees who are chronically ill to be promoted and obtain a better salary, which may lead to the feeling of an increased level of stress [23, 24, 25]. In such a situation, it becomes particularly important to adjust a workplace to the needs of people with issues resulting from cardiovascular diseases.

Implementing changes based, for instance, on avoiding work overload, adjusting professional duties to the skills of the workers and increasing support at workplace, is recommended by the Directorate General for Employment, Social Affairs and Inclusion in the European Union. The above-activities may contribute to lowering the stress level at a workplace and reduce the risk of exacerbation of the symptoms of CDVs, reduce the possibility of depression among workers and other psychological disorders [26, 27]. It needs to be emphasized, however, that there is need to conduct further research devoted to the occurrence of CVDs in workers. Literature describes research which shows the increased risk of recurring CVDs in workers exposed to stress after an illness [28], although there are also works describing lack of such dependency [29].

## CONCLUSIONS

1. A high level of stress at work occurred in almost half of the examined women with and without CVDs.

2. The most frequent groups of causes of stress in the respondents, both with and without CVDs, were social contacts and lack of rewards and support.
3. Stress at work among the examined women most frequently concerned their inability to stop thinking about work, they had too many professional duties, they were treated unfairly and were underappreciated at work, they could not count on the support of their bosses, they had a sense of insecurity, they had to go quickly from one task to another, they were surprised by their tasks, they were rushed at work, there were changes at the workplace, and they had to arrive and leave at a certain time.
4. Women with CVDs, more so than those without CVDs, were significantly more frequently tensed about their health due to harmful factors or because of an accident at work, changes at the workplace, the necessity to compete with others, and the necessity to perform a task despite the lack of means to do so.
5. Procedures that lower stress at work, as well as those concerning effective methods of managing it, should be popularized and implemented, including such a population as women at productive immobile age, so as not to deepen their health problems and sustain their ability to work as well as their well-being.

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Generation of the DOI (Digital Object Identifier) – task financed under the agreement No. 618/P-DUN/2019 by the Minister of Science and Higher Education