



## Working Conditions And Dynamics Of Indicators Of The Cardiovascular System Of Sewer Workers Of Sewing Industry Of Uzbekistan

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### Abstract

Sewing productions occupy a leading place in the intensively developing textile industry of Uzbekistan, where large contingents of women are employed, and the profession of a seamstress-mechanic is the most popular profession. A study of the working conditions of seamstresses-minders working at modern, modernized sewing facilities of Oktepa Aqua Service LLC, Tashteks and Boyteks JVs in Tashkent showed that in the course of their work they are exposed to the adverse effects of noise, general vibration, high levels air temperature in the warm period of the year, the intense nature of the labor process. The working conditions of seamstresses belong to the 3rd class of the 3rd degree of harmfulness. Working conditions and the nature of labor processes cause them to stress the cardiovascular system, which is compensatory in nature. During the hot season, there is a significant weakening of the functional reserves of the cardiovascular system. To stabilize the indicators of the cardiovascular system of seamstresses, it is necessary to introduce hygienic recommendations for improving working conditions.

**Keywords:** sewing industry, working conditions, harmful production factors, seamstresses-minders, cardiovascular system.

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## Introduction

At the present stage of development of preventive medicine, the leading direction of research is the development of evidence-based approaches to solving the problem of protecting workers from occupational risks and maintaining their health, identifying harmful production factors in new modernized industries, their impact on the functional state of the body, followed by the development of measures to prevent adverse effects and optimization of production activities.

In Uzbekistan, one of the most dynamically developing sectors of the economy is the textile industry, in the structure of which one of the first places is occupied by clothing production, which operate high-performance equipment, flow, automated lines. Sewing production belongs to those industries in which there is a high differentiation of labor with low energy costs, which does not allow such labor processes to be classified as difficult, but they require significant visual and psycho-emotional stress. Due to the radical technical re-equipment and the introduction of progressive production methods, the study of working conditions in garment industries, their impact on the functional state of the body of workers, the identification of production factors that may cause the development of production-related diseases, and the development of evidence-based preventive measures are currently acquiring actual hygienic meaning.

## The main results and findings

The aim of the research was to identify unfavorable production factors of modern sewing industries and their influence on the dynamics of indicators of the functional state of the cardiovascular system of women working as seamstresses.

**Materials and research methods.** The studies were carried out at modern, modernized sewing production facilities of Oktepa Aqua Service LLC, Tashteks and Boyteks JVs in Tashkent. Working conditions were studied by traditional methods using a psychrometer, anemometer, aspirator, luxmeter, sound level meter in accordance with the requirements of the Sanitary Rules, Norms and Hygienic

Standards of the Republic of Uzbekistan No. 0294-11 [1], 0141-03 [3], 0324-16 [4 ], 0325 - 16 [5], 0326 -16 [6], building codes and regulations 2.01.05-96 [11], as well as the methodology "Methodology for assessing working conditions and certification of workplaces according to working conditions" [9].

The physiological indicators of the cardiovascular system of seamstresses were studied in the following order: before starting work, the initial, background characteristics of the indicators were recorded, and then the physiological reactions that develop during the working day. Indicators of the cardiovascular system were studied by palpation counting of the pulse rate and sound measurement of blood pressure, followed by calculation of pulse pressure, systolic and minute blood volumes, mean dynamic pressure and peripheral resistance in capillaries [12]. The studies were carried out in the spring period of the year with optimal microclimate indicators and in the summer period at elevated air temperatures at workplaces. Practically healthy seamstresses-minders aged from 25 to 41 years old with work experience from 4 to 15 years were examined.

**Research results.** The conducted studies showed that at the surveyed sewing production, seamstresses - motorists carry out conveyor tailoring of products (t-shirts, T-shirts, tracksuits). In total, 8-10 people are involved on one conveyor line (cell). For a shift, 1 cell produces from 600 to 800 pieces of products.

It was established that the level of dust content at various workplaces of seamstresses ranged from 0.5 to 0.8 mg/m<sup>3</sup>, with average values of 0.75±0.02 mg/m<sup>3</sup>, that is, it did not exceed the hygienic regulations. The microclimate indicators in the spring observation period were optimal, and in the summer period the average shift air temperature was 33.2 ± 2.3 ° C with a relative humidity of 35.2 ± 2.2% and an air mobility of 0.6 ± 0.2 m / sec. The temperature index of workplaces ranged from 30.1 to 30.7 °C, averaging 30.5 ± 0.5 °C (the permissible level of the temperature index for category II of work severity is 30.2 °C), i.e. according to the temperature index, the

working conditions of women of the main professional groups in the warm period of the year belong to the 3rd class of the 1st degree of harmfulness. In addition, seamstresses are exposed to general production noise up to 81-83 dB and general low-frequency vibration recorded on the cover of sewing tables, which exceeds the norm by 1-2 dB in terms of vibration velocity.

The lighting in the surveyed sewing workshops is combined: natural through the side window transoms and general overhead, made with fluorescent lamps at a height of 2m 20 cm above the work tables. The illumination level fluctuated at various workplaces from 200 to 900 lux, the average level was  $520.8 \pm 15.4$  lux, the natural light coefficient was  $7.4 \pm 0.13\%$  on average.

The work of seamstresses is performed in a forced working position - "sitting". The labor process is characterized by a tense character with a high level of concentration and vision throughout the entire shift, monotony with monotonous, often repeated movements of the hands and forearm, emotional stress associated with the degree of responsibility for the quality of products and depending on the complexity of the product.

According to the totality of production factors (microclimate, noise, vibration, intensity of the labor process), the working conditions of seamstresses belong to the 3rd class of the 3rd degree of harmfulness.

The data obtained during the study and assessment of the working conditions of seamstresses indicate a possible occupational risk of health problems for working women [5], the level of which is above average.

The cardiovascular system, providing blood supply to all organs and systems, reacts in the most subtle way to a wide variety of processes in the body, which is important in the combined impact on workers of production activities and specific working conditions. It is known that the level of working capacity depends on the functional state of various body systems of workers, and, first of all, the cardiovascular system [1, 10].

The climatic conditions of Uzbekistan with its hot dry climate create an additional load on the human body, its thermoregulatory system, the regulation of which is ensured by a

change in vascular tone and the entire cardiovascular system. Therefore, the state of the cardiovascular system in working women was studied in the transitional spring period of the year at optimal temperatures and in the hot season at high air temperatures.

Table 1 presents the results of studying the dynamics of indicators of the cardiovascular system in seamstresses - minders in the spring period of the year. As can be seen from the table, their pulse rate before work averaged  $73.5 \pm 2.2$  beats per minute. In the dynamics of work, the heart rate increased by the lunch break to  $75.5 \pm 2.4$  beats per minute, and by the end of work to  $85.0 \pm 1.6$  beats per minute ( $p < 0.001$ ). The maximum arterial pressure averaged  $109.0 \pm 2.7$  mm Hg, during the first half of the shift it increased to  $117.0 \pm 5.5$  mm Hg, and by the end of work it increased even more in on average up to  $125.0 \pm 2.7$  mm Hg. ( $p < 0.001$ ). The minimum arterial pressure before work was on average  $66.0 \pm 1.3$  mmHg, by the lunch break it increased to an average of  $74.0 \pm 2.7$  mmHg, and by the end of work up to  $80.0 \pm 0$  mmHg average.

Thus, the performance of production operations by seamstresses, associated with the intense nature of the labor process, a high level of concentration of attention and vision in conditions of increased noise, leads to a change in the functional state of the cardiovascular system of workers. From the beginning to the end of the work shift, reactions are observed that indicate a hypertensive type of changes in the parameters of the cardiovascular system.

The data obtained are confirmed by hemodynamic parameters. In the dynamics of the shift, there is a tendency to increase pulse pressure. If at the beginning of the shift it was on average equal to  $43. \pm 1.3$  mm Hg, then by the end of the shift it was at the level of  $45.0 \pm 1.7$  mm Hg.

The amount of blood flowing through the vessels depends on the mean - dynamic pressure, which is the resultant of all pressures throughout the entire cardiac cycle.

Average - dynamic pressure in the examined seamstresses - minders in the dynamics of the shift significantly increased ( $p < 0.001$ ). If at the beginning of work it was on average equal to  $81.1 \pm 1.8$  mm Hg, then by

the end of the first half of the shift it increased to  $89.1 \pm 3.7$  mm Hg, and by the end of work to  $95.4 \pm 1.6$  mm Hg.

For a more complete picture of the state of the cardiovascular system, systolic and minute volumes of the heart were studied. It is known that minute volume depends on systolic volume and pulse rate. If the pulse rate can vary within fairly wide ranges, then the limit to the increase in systolic volume is limited. With a constant pulse rate, the value of systolic volume depends on the degree of filling of the heart during diastole, it is proportional to the initial length of the muscle fibers. The more the heart fills during diastole, the more blood it ejects during systole. The filling of the heart

with blood during diastole is largely determined by the magnitude of venous pressure, which in turn is regulated by sympathetic innervation. It follows that the ability of the heart to increase the systolic volume is very limited, since it is determined not only by the elasticity of the heart muscle fibers, its strength, but also by the innervation factor. An increase in cardiac output due to an increase in systolic volume with a constant pulse is the most favorable reaction of the body, as it indicates the use of such opportunities as the power of the heart muscles, i.e. function that is most associated with training [10].

**Table 1.** Parameters Of The Cardiovascular System In Seamworks Motor Workers During The Spring Period Of Observations

Hemodynamic parametrs	8 <sup>00</sup>	12 <sup>00</sup>	17 <sup>00</sup>	Authenticity	
	M±m	M±m	M±m	t	p<2.4
1	2	3	4	5	6
Pulse (b. in min.)	73,8±2,2	75,5±2,4	85,0±1,6	4,11	0,001
Arterial pressure (mm.rt.st.):					
Maximum					
Minimum	109,0±2,7	117,0±5,5	125,0±2,7	4,2	0,001
Pulse					
Medium-dynamic	66,0±1,3	74,0±2,7	80±0	10,7	0,001
Systolic volume of the heart (ml)	43,0±1,3	43,0±4,1	45,0±1,7	0,95	-
	81,1±1,8	89,1±3,7	95,4±1,6	5,95	0,001
Minute volume of the heart (ml)	65,5±2,3	60,7±3,4	58,1±2,0	2,43	0,05
Peripheral resistance in capillaries (dyn)	4861,4±62,5	5035,9±97,3	4945,2±35,4	1,3	-
	1376,8±36,2	1558,4±85,5	1558,4±22,3	4,27	0,001

Data on the state of the systolic volume of the heart in the dynamics of work in seamstresses - minders are also presented in Table 1. A significant ( $p < 0.05$ ) decrease in the dynamics of the change in the systolic volume of the heart is noteworthy, which indicates a weakening of the strength of the contractility of the heart muscle. Before work, the systolic volume of the heart averaged  $65.5 \pm 2.3$  ml, by the lunch break it decreased to  $60.7 \pm 3.4$  ml,

and by the end of work to  $58.1 \pm 2.0$  ml. Due to the fact that during the working day there is a significant increase in heart rate by 10-12 beats per minute on average, the decrease in systolic volume does not affect the minute volume of blood, which at the beginning of work is equal to an average of  $4.8 \pm 0.06$  l, and in end  $4.9 \pm 0.03$  l.

The hypertensive orientation of the reactions of the cardiovascular system when

working with seamstresses is also confirmed by data on peripheral resistance in the capillaries, which are the entire magnitude of the obstacles that the vascular bed has for the passage of blood. It was found that it significantly ( $p < 0.001$ ) increases from the beginning to the end of the shift. At the beginning of the working day, the peripheral resistance in the capillaries of seamstresses was equal to  $1376.8 \pm 36.2$  dynes on average, by the lunch break it increased to  $1558.4 \pm 85.4$  dynes and remained at this level until the end of the shift.

Consequently, under conditions of optimal air temperatures at the workplaces of seamstresses, in the presence of unfavorable production factors: noise, general vibration and a tense, monotonous nature of the labor process, working women from the beginning to the end of the work shift from the beginning to the end of the work shift from the side of the cardiovascular system developed reactions

indicating about the compensatory tension of a hypertensive nature, manifested in an increase in heart rate by an average of 15.2% from the background to the working level, an increase in systolic and diastolic blood pressure by 14.6 and 21.2%, respectively, an increase in average dynamic pressure by 17.6% .

Table 2 presents the results of studying the dynamics of indicators of the cardiovascular system in seamstresses-minders in the warm season.

The results of the research show that in the summer period of observations, seamstresses-minders have a significant ( $p < 0.001$ ) increase in heart rate by 22.7% on average from the background to the working level from the beginning to the end of the work shift. At the beginning of work, the average heart rate was  $72.0 \pm 1.8$  beats per minute, by the lunch break it increased to  $78.4 \pm 2.1$  beats per minute, and by the end of work it was at the level of  $88.4 \pm 1.8$  beats per minute.

**Table 2.** Indicators Of The Cardiovascular System In Summer Period Of Observations

Hemodynamic parametrs	8 <sup>00</sup>	12 <sup>00</sup>	17 <sup>00</sup>	Authenticity	
	M±m	M±m	M±m	t	p<2-4
1	2	3	4	5	6
Pulse (b. in min.)	72,0±1,8	78,4±2,1	88,4±1,8	6,45	0,001
Arterial pressure (mm.rt.st.):					
Maximum					
Minimum	112,;±2,2	106,4±3,2	101,6±2,0	3,56	0,01
Pulse					
Medium-dynamic	70,5±1,6	72,2±1,8	78,4±1,4	3,86	0,001
Systolic vo-	42,2±1,4	34,2±1,6	23,4±1,6	8,86	0,001
lume of the heart	84,2±2,1	83,6±1,9	86,2±1,9	0,7	-
(ml)					
Minute vo-lume of the heart (ml)	62,2±2,3	51,7±2,4	44,3±2,0	6,01	0,001
Peripheral resistance in capillaries (dyn)	4507,2±35,4	4053,2±41,8	3923,2±30,6	12,5	0,001
	1494,1±23,4	1649,6±31,4	1757,3±27,7	7,26	0,001

In addition, in the dynamics of the shift, working seamstresses-minders showed a decrease in maximum arterial pressure ( $p < 0.01$ ) and an increase in minimum arterial pressure ( $p < 0.001$ ). At the beginning of the shift, the level of maximum arterial pressure averaged  $112.4 \pm 2.2$  mm. rt. Art., by the lunch break decreased to an average of  $106.4 \pm 3.2$  mm. rt. Art., and by the end of the shift to  $101.8 \pm 2.0$  mm. rt. Art. The minimum arterial pressure at the beginning of work was on average  $70.2 \pm 1.6$  mm. rt. Art., in the first half-shift it increased to  $72.2 \pm 1.8$  mm. rt. Art., and by the end of the work up to  $78.4 \pm 1.4$  mm Hg. Art. In the dynamics of the shift, there was also a significant decrease in pulse pressure ( $p < 0.001$ ) from  $42.2 \pm 1.4$  to  $23.4 \pm 1.6$  mm. rt. Art. at a relatively stable average - dynamic pressure.

It is noteworthy that in the dynamics of work, the systolic volume of the heart decreases by more than 40% from the background to the working level ( $p < 0.001$ ), and this is accompanied by a decrease in the minute volume of the heart, despite a significant increase in heart rate. Peripheral resistance in capillaries increases from 1494 to 1757.3 dynes on average.

The analysis of the obtained data shows that the labor process of seamstresses-minders in the summer at elevated levels of air temperature in workplaces, combined with industrial noise, causes a significant weakening of the functional reserves of the cardiovascular system in working women, the development of unfavorable changes in hemodynamic parameters in the dynamics of work.

The described changes in hemodynamic parameters indicate a significant weakening of the functional reserves of the cardiovascular system and may be the cause of the development of subsequent pathological changes [10].

To stabilize the indicators of the functional state of the cardiovascular system of seamstress motorists, to maintain their high level of working capacity and labor productivity, it is necessary to introduce measures to reduce the harmful effects of

production factors, to rationalize work and rest regimes, and to take preventive measures.

## CONCLUSIONS

1. The main unfavorable production factors for the jobs of seamstresses working in modern modernized sewing factories are noise, general vibration, high air temperature in the warm season, and the intense nature of the labor process. Working conditions belong to the 3rd class of the 3rd degree of harmfulness.
2. The working conditions and the nature of the labor process causes stress in the working women of the cardiovascular system, which is of a compensatory nature.
3. During the hot period of the year, working women experience a significant weakening of the functional reserves of the cardiovascular system.
4. To stabilize the indicators of the cardiovascular system, it is necessary to introduce hygienic measures to improve working conditions.

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