Functional condition of cardiovascular system of women employed in knitwear factories in the hot period of the year

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During the hot period of year when working conditions are aggravated with the high temperatures of air at workplaces, the exhaustion of functionality of cardiovascular system is observed and this can serve as one of the reasons for the development of subsequent pathological changes.

Keywords: Knitwear factories, working women, functional condition, cardiovascular system

Introduction

Knitwear production is intensively developing in Uzbekistan with more and more joint ventures equipped with new imported technology being created and new modern technologies being implemented that are all together leading to change of working conditions at knitwear production enterprises.

Climatic conditions of Uzbekistan with its hot dry weather put additional pressure on an organism of the person. It has been proven that the level of diseases of women working in the textile manufacturing located in hot climate conditions is considerably higher than women working in other districts (Singh, Fotedar and Lakshmi-Narayana, 2005). The interest in studying the influence of professional factors on cardiovascular system has increased in recent years. Even though it is obvious that these professional factors make a certain contribution to the development of cardiovascular diseases, they are not a main reason for the emergence of such diseases. Proving the role of professional factors in the development of changes in cardiovascular system is a complex and difficult challenge demanding the consideration of social and genetic factors along with identifying the role of separate professional irritants (Vizel, Zeltzer and Karimov, 1995; Konchalovskaya and Guskova, 1976). Important aspect of a problem is the significance of changes of cardiovascular system in dynamics of labor process at various professional influences.

The objectives

To study the dynamics of a functional condition of cardiovascular system of the women working in knitwear production during the hot period of the year at 31-35°C temperature at workplaces.

Research methods

The functional condition of a cardiovascular system was studied based on hemodynamic indicators. Pulse rate (PR) was counted based on palpation method
on a radial artery, arterial blood pressure (ABP) pulse was measured using Korotkov's sound method. Pressure (PP), systolic (SV), and minute volume of blood (MVB) were determined by Starr's formula calculation method, mid-dynamic pressure (MDP) and peripheral resistance in capillaries (PR) were determined through Hikem's formula (Likhnitsky, 1962):

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PP = \Delta P_{\text{max}} - \Delta P_{\text{min}}
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SV = 100 + 0.5 \times PP - 0.6 \times \Delta P_{\text{min}} - 0.6 \times \text{Age}
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MVB = SV \times PR
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MDP = PP/3 + \Delta P_{\text{min}}
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PR = MDP \times 1333 \times 60 / MVB.
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Observations were carried out in dynamics: at the beginning of work, before a lunch break, and at the end of working day.

**Research findings**

Knitters showed authentic (p<0.001) pulse increase by 18.7% on average from background to an operating level during the summer period of supervision from the beginning till the end of the shift. At the beginning of work the pulse of the surveyed knitters was on the average equal to 70.4±0.2 beats per minute while during the lunch break frequency increased to 76.4±0.2 bpm and by the end of the working day the rate of 83.6±0.4 bpm was observed.

Besides, working knitters showed the tendency of change to decrease maximum the AP and increase minimum the AP (p<0.001). At the beginning of change the maximum AP averaged at 113.2±0.8 millimetre of a mercury column (mm m.c.), during the lunch break it decreased to an average of 111±0.8 mm m.c. and by the end of the shift to 107.8±0.6 mm m.c. Minimal AP at the beginning of work averaged at 60±0.1 mm m.c., in the first half shift it increased to 63.5±0.6 mm m.c., and by the end of work to 72.3±0.8 mm m.c. Also in dynamics of change a considerable decrease in PP (p<0.001) with 53.4±0.4 to 34.7±0.7 mm m.c. is revealed at rather stable MDP. It should be noted that in dynamics of work of knitters with 37.8% on the average from background to an operating level decreases in SV of blood (p<0.001). At the beginning of the working day SV of blood was on average equal to 60.9±0.48 ml, during the lunch break it decreased to 56±0.3 ml and by the end of work it was 44±0.3 ml. It was accompanied also by reduction of MVB, despite considerable increases in pulse. So, if at the beginning of a shift the MVB was equal on average to 4301.6±0.6 ml, at the end of work it decreased to 3692.8±0.8 ml (p<0.001). PR in capillaries increased in dynamics of work with 1448.1±2.17 to 1716.5±3.95 dyn (p<0.001).

The analysis of the accumulated data shows that labor process of knitters during the summer period at the increased temperatures of air coupled with production noise and intense nature of labor process, under the conditions of dynamics causes unfavorable changes in indicators of haemodynamics that serves as evidence to considerable weakening of functional reserves of cardiovascular system (Umidova, Glezer, Yanbaeva, and Korol, 1975).

Similar results were received when inspecting other professional groups of women occupied in knitwear production.

The data received when inspecting cardiovascular system at motor-knitters during the summer period of observation showed that from the beginning by the end of the shift authentic increase of pulse was noted. If at the beginning of the work motor-knitters’ pulse was on average equal to 72.8±0.3 bpm, by the end of the shift it became frequent at 85.8±0.4 bpm on average (p<0.001).
In work dynamics maximum level of AP did not change, while the minimum increased from 61.6±0.6 till 71.0±0.5 mm m.c. (p<0.001) that led to decrease in pulse arterial pressure. At the beginning of work PP was on average equal to 54.4±0.19 mm m.c., till the lunch break it decreased to 42.2±0.27 mm m.c., and by the end of the working day - to 32.5±0.3 mm m.c. (p<0.001). From the beginning till the end of the working day an increase in MDP was observed also. Before work, MDP of motor-knitters was on average equal to 78.3±0.12 mm m.c., and at the end of work to 82.9±0.2 mm m.c. (p<0.001).

From the beginning till the end of the working day motor-knitters showed a decrease in both systolic and minute blood volumes. SV of blood decreased to 74.4±0.23 to 57.5±0.5 ml (p<0.001), and the MVB from 5304.8±0.1 to 4808.7±0.2 ml (p<0.001) despite the increase of pulse at 17.8% from background level. In dynamics of change the increase in peripheral resistance in capillaries from 1193.8±11.4 to 1402.9±14.7 dyn (p<0.001) was also observed.

Findings of studies of cardiovascular system where the pressers of knitwear productions were the subjects of the survey that was conducted in the summer period showed pulse increase, decrease of maximum and pulse AP, increase of minimum and mid - dynamic the AP.

Frequency of their heart contractions before work was on average equal to 73.4±0.4 b pm, during the lunch break increased to 81.5±0.4 b pm, and by the end of the work to 87.0±0.4 b pm (p<0.001).

Maximum the AP decreased during the working day from 113.6±3.9 to 104.8±3.3 mm m.c. (p<0.05), PP with 45.6±0.2 to 28.8±0.3 mm m.c. (p<0.001). Minimal AP increased from 68.5±0.6 to 74.6±0.8 mm m.c. (p<0.001), and MDP from 84.7±0.1 to 115.2±3.0 mm m.c. (p<0.001). It was accompanied by a decrease in SVB: if before work SV of blood was equal on average to 58.5±0.5 ml, during the lunch break it decreased to 52.1±0.3 ml and by the end of the work to 46.0±0.3 ml (p<0.001). Despite pulse increase, a decrease in MVB was noted during the working day. So, if at the beginning of work the MVB of pressers was equal to 4303.2±0.5 ml, during the lunch break it decreased to 4242±0.5 ml, by the end of the work it averaged at 4131.2±0.5 ml (p<0.001). PR in dynamics of work increased in capillaries from 1583.2±1.6 to 1642.0±3.8 dynes (p<0.001).

Therefore, dynamics of indicators of cardiovascular system of working women points to considerable weakening of functional reserves of cardiovascular system in the warm period of the year during production process and in the conditions of the increased air temperatures at workplaces.

For the subsequent elaborations of recommendations about rationalization of a mode of work and rest while carrying out chronometric observations of hourly dynamics of frequency of heart contractions of working women of the basic professional groups of knitted manufactures have been studied.

In all professional groups three authentic increases in pulse of 5-10% from an operating level was marked close to working during the lunch break at the rate of miles increase was even more expressed, during the lunch break it decreased, but did not restore to initial level. In the second half-shift authentic increase of pulse was observed also. Close to 6th working hour pulse of motor-knitters became frequent on average at 14%, of pressers - at 12.8%, and of knitters at 13.8%. During the next hours of the second half-shift the increase in frequency of heart contractions became even more expressed and by the end of shift it made 20% and even higher percentage from background level.

The findings of the research were used by developing rational modes of work and rest of women working in knitwear production, experimental introduction of which allowed lower adverse influence of production factors and labor process on dynamics of a functional condition of cardiovascular system.
Conclusion

During the hot period of the year when working conditions are aggravated with the increased temperatures of air at workplaces, from the beginning till the end of a labour shift, working women show considerable increase in pulse, decreased maximum and increased minimum AP, reduction of PDP, and increase of MDP, considerable decrease of SV, and the MVB is observed at increased rate of PRC in capillaries, it indicates an exhaustion of functionality of cardio-vascular system and can be a reason for developing the subsequent pathological changes.

Development of pressure in cardiovascular system indicators is noted on the 3rd and 6th working hours, and a maximum on the 7th and the 8th hours of the working day. Introduction of rational modes of work and rest has allowed to lower a functional pressure of cardiovascular system.

References

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