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THE STUDY OF CARDIOVASCULAR AND RESPIRATORY MANIFESTATIONS IN WORKERS IN THE TEXTILES INDUSTRY FROM RM. VÂLCEA

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Introduction

Recent Occupational Medicine studies have focused on the concept of job-related diseases. Work-related diseases are diseases of multifunctional determination, the working environment and conditions having a high percentage in their causality, this percentage being illustrative among the other possible etiological factors.

Work-related diseases are mainly determined by the specific conditions and requirements of the labour process, by the environment and the examined people’s own functional anatomical factors. The first position in the classification of work-related diseases is occupied by high blood pressure (HBP), which is extremely common, closely followed by respiratory diseases, such as occupational asthma (OA).

Since these conditions are common in the textiles industry workers, the paper proposes to make a comprehensive, clinical and para-clinical study of a batch of 250 textiles workers from the factory X'ESTER S.A., in Rm.Vâlcea, in view to the early detection of disease. The purpose of this paper is to analyze the textiles workers’ initial state of health and some local features using non-invasive, traditional and new methods, exploring cerebral irrigation using the Doppler ultrasound method, which is less mentioned in literature.

We have chosen this theme because it represents a health problem in our area as well, with the aim to initiate a programme of prevention and treatment so as to contribute to the prevention of cardiovascular and respiratory morbidity and mortality among textiles workers.

Generalities

1. Peculiarities of the activity and working conditions in the textiles industry

This chapter describes the professional requirements for manufacturer operators, the sewing machines, the working position and how it affects the workers’ health (Chiriac R., 1999; Toma I., 2007). The factors that influence the textiles workers’ health are presented: exposure to vibration, textiles dust, chemical substances, and noise.
2. Etiopathogenesis data of professional asthma

The main etiological factors are presented: the occupational allergens (Naghi Eugenia, 2001), the predisposing etiological factors, working environment, technological processes and jobs (Niculescu T., 1985).

An important subchapter covers bronchial reactivity and inflammation (Berger P., et al, 2002); bronchial reactivity and neurotransmitters – of the autonomous nervous system and the mediators produced by the inflammatory cells (Karlson J. A., 1994, Schneider F., Georgeta Mihalaş, 1998); bronchial reactivity, mediators and bronchial epithelium.

3. Non-invasive imaging cardiovascular techniques

We have presented concepts related to: ECG (Gusti Simona, et al, 1997), effort ECG test, long-term - 24 h ECG recording- (Holter) that can be used to appreciate the index of the QT variability, the heart beat variability; alternation of T wave; QRS signal mediation; Holter SAEG, (Guyton A., 1996); mediation of P wave signal; vectocardiography (Carp C., et. al., 2002); echocardiography (Ginghină C., et. al., 2005); heart and blood vessels radiography; computer-tomography and magnetic resonance imaging (Bedeleanu, Căpalneanu R., 1997); electrical trans-thoracic bio-impedance (Tudor Despina, 2010), functional arterial and vascular exploration: measuring SBP, DBP, arterial pulse recording, plethysmography (Gusti Simona et. al., 1997); skin thermography, transcutaneous determination of oxygen pressure (Cândea V., 2001); Doppler ultrasound vascular exploration (principle and parameters of D curves) (Dudea S.M., et. al., 2004; Gusti S., et. al., 2004)

4. Ventilatory functional exploration of the respiratory system

This chapter describes pulmonary ventilation and pulmonary ventilation exploration (Hăulica I., 2007) using: pneumography, spirography, pneumotachography, plethysmography, inert gas fusion analysis - pulmonary volumes (Naghi E., 1997), pulmonary capacity (Barbu R., 1979), pulmonary flow (Sabău M., 1999), tests of bronchial hyperreactivity (T. Niculescu, 1985) are presented.
Personal contributions

5. Purpose of the research

The research aims to analyze the real initial situation of the study group, of some local peculiarities, as well as to elaborate and apply a programme of prevention and treatment of both hypertension and occupational asthma (OA) and of associated risk factors and to contribute to the prevention of cardiovascular and respiratory morbidity and mortality.

Objectives of the study

To achieve the goals of this research, we have established the following objectives:

- The study of hypertension and ABP prevalence at the studied group; both SBP and DBP are explored as independent risk factors for coronary heart disease and strokes; TA (MAPA) will be monitored for 24 hours if it is needed;

- The study of prevalent associated risk factors for HTA and AB, such as: age, smoking, diabetes, metabolic syndrome, family history, C-reactive protein, sex, obesity, allergens, predominantly viral infections, cigarette smoke, diet;

- The estimation of the prevalence and importance of HVS, as an independent risk factor of heart diseases and airway inflammation in asthma. The presence of HVS will be detected by ECG, echocardiography and the type of hypertrophy will be established: concentric, eccentric, asymmetric, interventricular septum hypertrophy, VS size. The non-invasive evaluation of bronchial inflammation in asthma can be achieved by induced sputum analysis with hypertonic saline and nitric oxide (NO) analysis in the expired air. The asthma shares a particular type of bronchial inflammation, namely, eosinophilia.

- The study of the presence of vascular reshaping, of endothelial dysfunction and of airway remodelling. It studies and analyzes the atherosclerotic vascular changes in the aorta, the carotid arteries, and the lower limbs by using the non-invasive Doppler ultrasound method.

- The study of the prevalence of diabetes mellitus associated to cardiovascular and respiratory affections at the examined batch.
-The determination of damage to target organs (heart, kidneys, brain) is done by: complete clinical examination, electrocardiogram, two-dimensional echocardiography, cerebral vascular Doppler, heart and lung radiography, eye fundus, microalbuminuria, creatinine and C-reactive protein.

-The study of the presence of contributing factors to respiratory system damage and the quantification of the seriousness of diseases.

6. Material and methods

6.1 The study batch

We studied clinically and para-clinically a group of 250 employees from the company X'Ester S.A. Râmnicu Vâlcea, having as main activity the production and commercialization of cotton blended fabrics and textiles. The unit has an average number of 250 employees working in 2 shifts of 8 hours each. It is divided into 5 production sections as follows: 30 employees for the spinning mill, 48 for the weaving mill, 28 for finishing, 62 for tailoring, 48 for mechano-energetic and auxiliaries, 24-Tesa employees.

The study was prospective, longitudinal and observational and it has lasted for four years.

The employees were 89.60% city dwellers, while 10.40% were rural. Distribution by sex: 175 were women and 75 men, representing 70% and respectively, 30%. Gender ratio W / M was 2.33. The average age of the group included in the study was 36.19 with a standard deviation (SD) of 8.71.

The youngest person is 16 years old and the oldest is 65 years old. It appears that the most numerous are those aged 30-39 years (60.80%), followed by those aged 40-49 years (21.20%). In the same age group women are more numerous than men: 62.86% to 55.9%.

By comparing the average age of women and men, we found a significant difference statistically speaking, women being younger than men (35.38 years vs. 38.03 years).

6. 3. Study methods

6.3.1. THE STUDY OF THE JOB AND PROFESSIONAL ANAMNESIS
The technological process is described: the raw material indispensable in the production process is cotton, brought in cotton bales weighing 200-300 kilos from the raw materials warehouse into the spinning mill, where the process is as follows: repeated beating of the material, carding, rolling, spinning using flyers, spinning using ring machines.

6.3.2. Clinical examination

The clinical examination included physical examination for every system and apparatus, with focus on the respiratory and cardiovascular apparatuses, but also on medical anamnesis.

6.3.2.1. Clinical examination of the cardiovascular apparatus included: heart examination, apex shock, cardiac noises, the presence/absence of peripheral edema, of pulmonary stasis, of turgescent jugular veins; examination of peripheral arteries: presence/absence of pulse; examination of arteries: measuring TAS, TAD, VA (ventricular allure).

6.3.2.2. Clinical examination of the respiratory apparatus included: expiratory apnea, presence/absence of rhonchi, presence/absence of expiratory wheezing, determination of respiratory frequency, presence/absence of the hardened vesicular breath sound.

6.3.2.3. Sputum examination included: presence of eosinophils, presence/absence of Charcot-Leyden crystals, of Kurschmann spirals and of Koch bacillus.

6.3.2.4. Skin examination included: the dermal test to habitual allergens (dust, acarus, germs), the dermal test to cotton dust, the bronho-dilating test with Alupent.

6.3.2.6. The electrocardiogram (ECG) was done using an electrocardiogram machine HEART SCREEN/60 G with 12 derivations.

6.3.2.7. The echocardiograms were done using a SLEE 401-MOD,2D-mod apparatus.

6.3.2.8. The cerebral irrigation was estimated with the non-invasive ultrasound Doppler (D) exploration, using a HI-DOP apparatus with 4 MHz and 8 MHz probes. The following were estimated: the morphology of the vascular-cerebral waves on the bilateral commun carotid artery and the classic parameters of the D. waves for the evaluated batch, comparing them to those of a batch of 60 people that were the same age and clinically and biologically healthy, but that did not work in the textiles industry (office workers, nurses, shop assistants etc.).

6.3.2.9. We carried out ventilatory explorations for the batch using the EUTEST 112 machine and we determined the following parameters: SVC and FVC (slow vital capacity and forced), REF (reserve expiratory flow), RIF (reserve inspiratory flow), CF (current flow), respiratory
frequency, duration of a respiratory cycle, VEMS, IRB(VEMS/ CVF%), PEF(peak expiratory flow), MEF 25-75% (FEF 25-75%-forced expiratory flow).

7. Results

7.1. Of the evaluated group, 91 workers (36.40%) had low vital capacity; the remaining 63.60% had values within normal limits.

Comparing the average vital capacities of women and men, we have identified an important statistical difference, women having a smaller capacity than men (4096.49 ml vs. 4393.86 ml), but within normal physiological limits

7.2. Of the 250 patients examined, 58 (23.2%) had a VEMS reduced by 30%, and 192 patients (76.80%) had a normal VEMS.

7.3. Of the evaluated group a percentage of 14.40% had respiratory dysfunctions, and 1.60% of it was the asthma cases.

7.4. The results regarding blood glucose level showed that 85.60% had normal values; the remaining 14.40% were hyperglycaemic, but not diabetic.

7.5. The results on serum calcium levels in the examined group showed that for 33.20% (83 patients) the values were below normal values (> 9mg/dl) and for 66.80% (167 patients) the values were higher than normal values.

7.6. The results on blood flow revealed that for 14.40% of the group the values were above normal values. (> 15mm / h).

7.7. Following the determinations, 227 (90.80%) patients experienced a normal C-reactive protein value and only 23 (9.20%) patients, an increased one.

7.8. The results regarding the number of leukocytes show that 88.40% of the total patients had normal results.

7.9. The urine examination revealed that 17.05% of the cases presented leukocytes and 3.69% were cases of proteinuria.
7.10. Of the 250 patients, 234 (93.6%) had a normal level of creatinine and only 16 patients had increased levels.

7.11. The average blood cholesterol value was 178.05 with a standard deviation of 32.97. Blood cholesterol values vary between 100mg/ dl Minimum) and 386mg/dl (maximum).

7.12. The average triglycerides level was 150.55 with a standard deviation (SD) of 66.93. The average HDL cholesterol of the patients is 47.57 mg / dl with a standard deviation (SD) of 11.47.

7.13. A percentage of 18.80% of patients were identified with hypertension. There recorded values were between 120-160/ 60-100 mmHg.

7.14. The results of the extracranial vascular Doppler examination are changed at a rate of 16.80% of the total of 250 patients. We have noticed a decreasing process of the systolic speed with 18% and a growth of the resistance index with 23%, that shows a diminution of the cerebral irrigation and a growth of resistance in cerebral circulation.

7.15. The following changes were noticed after the electrocardiogram: atrial extrasystoles at 4.80%, ventricular extrasystoles at 3.60%, atrial fibrillation at 1.60%, myocardial infarction at 0.40%, right bundle branch block (RBBB) at 14% and left bundle branch block (LBBB) at 1.20%.

7.16. Skin tests showed: to usual allergens (house dust, mites, germs) - negative result; to cotton dust, dust from work – positive result; to the bronchodilator Alupent test – positive result; (VEMS increased by 35%). Sample from the working environment: positive (VEMS decreased by 30%).

7.17. The sputum examination showed: numerous eosinophils, Charcot-Leyden crystals, Kirschmann spirals, Koch bacillus - absent.

8. Correlations between the investigated parameters

8.1. Of the examined group 52.78% had respiratory dysfunctions and 47.22% of them were smokers.

8.2. Correlations between blood flow level and leukocytes number indicates the possible presence of focal infections, dental infections or rheumatic diseases.

8.3. Of the hypertensive patients, 47 patients (18.80%), 41 patients (87.23%) had left ventricular hypertrophy (LVH), and 2 normotensive patients had the same condition.
8.4. We have noticed the decrease of VS by 18-19% and of VD by 2-3%, fact that showed a reduction of cerebral irrigation, against the background of a hypertonia, strengthened by a growth of IR (22-23%). The Doppler parameters (r= - 0.563 și r= - 0.652) are in correlation with the growth of TAD and TAS and other clinical signs.

9. Discussions

The study group included a number of 250 patients who work in the textiles industry, in 2 shifts of 8 hours each at S.C. X'Ester S.A. in Râmnicu Vâlcea.

Most of the employees (89.60%) were city dwellers, while 10.40% were rural. Sex ratio: 175 were women and 75 men, representing 70% and respectively, 30% of the total. The gender ratio W/ M was 2.33. The average age of the group of patients included in the study was 36.19 with a standard deviation (SD) of 8.71. It appears that the most numerous are the group 30-39 years (60.80%) followed by the age group 40-49 years (21.20%). Comparing the average ages of women and men, we found a statistically significant difference, women being younger than men (35.38 years vs. 38.03 years).

In the Spinning mill department there were 4 cases of professional asthma (1.60%), percentage similar to the one specified in literature. After the examination the following results were recorded: only 91 workers (36.40%) had low vital capacity, the rest of 63.60% were within normal limits. Of the group, 52.78% presented respiratory problems, 47.22% of them being smokers. Of the 250 patients, 58 (23.2%) had a VEMS that was reduced by 30%, and 192 patients (76.80%) presented normal VEMS. Ventilatory examinations revealed: 3.60% (9 patients) mild obstructive airway diseases, 2.40% (6 patients) medium obstructive airway diseases, 4.40% (11 patients) mild joint dysfunctions, 1.20% (3 patients) medium joint dysfunctions and 1.20% (3 patients) mild restrictive dysfunction cases.

Hypertensive patients were found in the spinning mill (23), finishing (18) and the rest (7) in the Tesa department, representing 18.80% of the batch. The cerebral irrigation was measured using the non-invasive ultrasound Doppler method, which is less commonly used for the examination of cerebral irrigation with textiles workers. The results of the extracranial vascular Doppler examination showed changes for 16.80% of the total of 250 workers. One could see a reduction of 18%, respectively 19% of the systolic and diastolic speed on the common right,
respectively left carotid arteries, which draws attention to the reduction of cerebral irrigation. It is worth mentioning the increase of the resistance index with 23%, which draws attention to the growth of resistance in cerebral circulation, on the basis of hypertonia, especially with patients having HTA. This growth of the resistance index might explain the decrease of cerebral irrigation as well. The decrease of cerebral irrigation might be explained, on the one hand as a consequence of general hypertonia and cerebral circulation, and on the other side as a consequence of the presence of cervical spondylosis that most of the workers have - because of the working position (Zgăbăruş M., et. al., 2010, 2011, and 2012).

The following changes were noticed after the electrocardiogram: atrial extrasystoles at 4.80%, ventricular extrasystoles at 3.60%, atrial fibrillation at 1.60%, myocardial infarction at 0.40%, right bundle branch block (RBBB) at 14% and left bundle branch block (LBBB) at 1.20%.

Of the patients suffering from hypertension, 41 patients (4.65%) presented left ventricular hypertrophy (LVH), but 2 normotensive patients had the same condition, as well.

10. Conclusions

1. The present research paper has studied a group of 250 textile workers in the company S.C.X 'ESTER S.A. in Râmnicu Vâlcea, mostly women (175-70%) and 75 men, aged 16-65 years (the age group 30-39 years was 35.2% of the batch), predominantly urban (89.6%). The average age was 36.19 without significant differences between women and men. Of the total number 21.20% were smokers.

2. A complex clinical and para-clinical study was done, using non-invasive methods of exploration: determinations of SBP, DBP, AV, ECG, Doppler cerebrovascular exploration, spirogram, laboratory tests: VSH, blood sugar, urine analysis, urea, creatinine, cholesterol, triglycerides, leukocytes, sputum examination, skin tests.

3. Hypertensive patients were registered in the spinning (23) and finishing (18) departments, and the rest (7) at Tesa, representing 18.80%. Of these, 4.65% had concentric HVS type. Only 87.23% of these were detected with HTA without HVS.

4. The cerebral non-invasive ultrasound Doppler (D) exploration, using a HI-DOP apparatus with 4 MHz and 8 MHz probes, on the bilateral common carotid arteries for the textile group with hypertension showed changes for 16.80% of them. We noticed a reduction in systolic
velocity on the right common carotid artery of 18% and of 19% on the left artery, compared to the control group, which means a reduction in cerebral irrigation. It is worth mentioning the increase of the resistance index with 23%, respectively 22% on the right carotid artery, respectively the left one, which draws attention to the growth of resistance in cerebral circulation, on the basis of hypertonia, especially with textiles workers having HTA. The decrease of cerebral irrigation might be explained, on the one hand as a consequence of general hypertonia and cerebral circulation, and on the other side as a consequence of the presence of cervical spondylosis that most of the workers have, because of the working position.

5. The clinical examination and spirogram showed a reduction in vital capacity in 36.40% of the examined group and a reduction in VEMS by 35% to 23.20% of the patients. We noticed the presence of obstructive ventilatory dysfunction in 6% (mild obstructive ventilatory dysfunction for 3.60% and average obstructive ventilatory dysfunction for 2.40%).

6. Spirograph measuring, skin tests and sputum examination confirmed the presence of 4 cases of occupational asthma, which represents 1.60% of the study group.

7. As for the laboratory tests, blood glucose levels above the normal level were recorded only at 14.40% of the study group. Increased ESR, leukocytes over 10.000/mm3, elevated C-reactive protein were recorded in a few cases, attesting the presence of focal infections, rheumatic infections.

8. We observed a statistically significant correlation between smoking workers and the presence of ventilatory dysfunction, 52.78% of smokers had ventilatory dysfunctions, but also 47.22% of the non-smokers presented such dysfunctions. The risk of having respiratory dysfunctions is 2.87 times higher in smokers.

9. We must draw attention on a good correlation between hypertensive workers and the presence of LVH, determined by ECG. The risk of having LVS is 88.54 times higher in those with hypertension. There is also a good statistical correlation between those with hypertension and elevated blood cholesterol level and triglycerides and decreased HDL-cholesterol.

10. Note that 42 patients (89.36%) of those with hypertension (47 patients) had cerebrovascular Doppler changes as well.

11. The final conclusion:
- This paper presents a complex clinical and para-clinical study on cardiovascular and respiratory problems for a batch of 250 textiles workers in Râmnicu Vâlcea, targeting both their health condition and especially the prevalence of hypertension and asthma, a study little mentioned in the field literature.
- The results of this study revealed a small percentage of 1.60% of patients with occupational asthma, but an incidence of 18.80% with hypertension, 16.4% with HVS for the young workers’ group, aged under 40.

- It is worth mentioning that for patients with HTA cerebrovascular changes were observed, examined by using the non-invasive ultrasound Doppler method, that was not often used with this working category.

- Methods are necessary to improve the working conditions (providing good ventilation, moistening, monitoring the level of the dust in the working area, going to an annual complete medical checking, avoiding stress in the working environment) so as to prevent illness.
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