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## Cardiovascular Diseases Risk Factors in Male Population from Mining Vocational Schools of the Lublin Coal Basin*

Czynniki zagrożenia chorobami układu krążenia w populacji uczniów zasadniczych szkół zawodowych Lubelskiego Zagłẹbia Węglowego

Contrary to certain industrial countries which secure an impressive decrease in coronary heart mortality, Poland has had, especially in the last decade, the significant increase of morbidity and mortality caused by cardiovascular diseases (13). Although this phenomenon concerns mainly the middle-age mean groups (12), special care for the whole population should be undertaken. The successful way to decrease the death rate and morbidity attributed to coronary heart disease (CHD) are the long-term prevention programs as for example Multiple Risk Factor Intervention Trial (9), Belgian Heart Disease Prevention Project (8), Lipid Research Clinics Coronary Primary Prevention Trial (5) and others. Because there is some evidence that certain risk factors occur also among children (4), it seems that the effectiveness and efficacy of such prevention programs may be increased when started in the young population.

In the present study we would like to present the results of examination of students from mining vocational schools of the Lublin Coal Basin. The aim of this study was to evaluate the risk factors of cardiovascular diseases in young male population before the introduction of the preventive program, which is a part of a follow-up, long-term study devoted to the health protection and promotion in miners of the new coal mining area.

## MATERIAL AND METHODS

A group of 895 boys 14-17 years of age who started their training at mining vocational schools of the Lublin Coal Basin was subjected to examination. The main part of this population was of rural

[^0]origin ( $63.5 \%$ ), the next $21.8 \%$ was from small provincial towns, and only $11.6 \%$ of the boys were from the cities. The examinations were performed at the beginning of the school-year in 1986 and 1987.

The survey included the socio-medical questionnaire, the physician examination and some physico-chemical determinations. An electrocardiographic examination was carried out on each subject at rest in lying position using the standard 12 leads recorder. All the ECGs were read and coded according to the Minnesota code.

All the factors studied in the present paper are listed in Table 1.
The height was measured exact to 0.5 cm with the boys in socks and the weight with the adequacy of 0.1 kg with the boys in light clothes only. Blood pressure was measured by using mercury sphygmomanometer with the subjects sitting after 10 min . rest. The fasty blood sample taken by venapuncture and serum for laboratory examination was separated within 2 hrs. Total cholesterol, HDL cholesterol, trigliceride, glucose and uric acid were determined by standardized methods described earlier (14). LDL cholesterol level was calculated according to Fried e wald quotation (6):

$$
\text { LDL cholesterol }(\mathrm{mg} / \mathrm{dl})=\mathrm{TCh}-(\mathrm{HDLCh}+\mathrm{Tg} / 5)
$$

where: TCH - total cholesterol (mg/dl), HDLCh - HDL cholesterol (mg/dl), TG - trigliceride (mg/dl).

LDL/HDL cholesterol ratio and Brocka index (weight/height-100), were also calculated. According to some other authors $(7,11)$ the following indices were treated as potential risk factors of cardiovascular diseases development:

1) systolic and/or diastolic blood pressure above 95 centile of values observed in the boys' group;
2) ischemic type changes in resting ECG (type 1 or 2 according to Minnesota code);
3) total cholesterol concentration above $230 \mathrm{mg} / \mathrm{dl}(5.95 \mathrm{mmol} / \mathrm{l})$;
4) trigliceride concentration above $170 \mathrm{mg} / \mathrm{dl}(1.94 \mathrm{mmol} / \mathrm{l})$;
5) constant cigarette smoking (more than 5 cigarettes per day);
6) obesity;
7) positive family history of cardiovascular diseases or their risk (hypertension, heart infarct, obesity and diabetes).

All results of examination were collected and analyzed by PC/XT computer using DBase III and SPSS/PC statistical packages.

## RESULTS

The distribution of risk factors of cardiovascular diseases among the vocational mining schools students is presented in Table 2.

The total rate of individual risk is rather high and it reaches $55.6 \%$ of the whole group of the examined boys. Nevertheless, the actual number of students with some cardiovascular risk is lower because in some individuals a few separate risk factors can be stated. In this respect the total number of boys with the risk count 382 ( $42.7 \%$ of the examined), and the distribution of the number of risk factors in individual subjects is presented in Fig. 1.

It can be seen that the majority of boys from risk group - $74.1 \%$ have only one risk factor, whereas three or more appear in much smaller subgroup ( $6 \%$ ). The most frequent risk factor which appears in this young population is inherited susceptibility ( $25.6 \%$ ), cigarette smoking ( $15.2 \%$ ), and elevated blood pressure

Table 1．Examination of boys from vocational mining schools of the Lublin Coal Basin Factors studied

| No． | Datas | No． | Measurements |
| :---: | :--- | :---: | :--- |
| 1 | Age | 5 | Body height |
| 2 | Smoking habits | 6 | Body weight |
| 3 | Cigarette consumption in smokers | 7 | Brocka index |
| 4 | Parents diseases：hypertension | 8 | Blood pressure |
|  |  | heart infarct | 9 |
|  | obesity | Total cholesterol |  |
|  | diabetes | 10 | HDL cholesterol |
|  |  | 11 | LDL cholesterol |
|  |  | 12 | LDL／HDL ratio |
|  |  | 13 | Serum trigliceride |
|  |  | 14 | Blood glucose |
|  |  | 15 | Blood uric acid |

Table 2．Risk factors of cardiovascular diseases in boys from vocational mining schools of the Lublin Coal Basin（number and percentage）

| Age years | $\begin{aligned} & \mathrm{N} \\ & \% \end{aligned}$ | Risk factors |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | hyper－ tension | abnormal ECG | hypercho－ lestero－ lemia | hypertri－ gliceri－ demia | smoking habits | obesity | genetic risk |
| 14 | $\begin{aligned} & 8 \\ & 0.9 \end{aligned}$ | $\begin{gathered} 1 \\ 12.5 \end{gathered}$ | 二 | $\begin{gathered} 1 \\ 12.5 \end{gathered}$ | $\begin{gathered} 1 \\ 12.5 \end{gathered}$ | $\begin{gathered} 12.5 \end{gathered}$ | － | $\begin{gathered} 2 \\ 25.0 \end{gathered}$ |
| 15 | $\begin{array}{r} 651 \\ 72.9 \end{array}$ | $\begin{gathered} 38 \\ 5.9 \\ \hline \end{gathered}$ | $\begin{aligned} & 14 \\ & 2.2 \end{aligned}$ | $\begin{aligned} & 23 \\ & 3.6 \\ & \hline \end{aligned}$ | $\begin{aligned} & 25 \\ & 3.9 \end{aligned}$ | $\begin{gathered} 74 \\ 11.3 \end{gathered}$ | $\begin{array}{r} 3 \\ 0.6 \end{array}$ | $\begin{array}{r} 162 \\ 24.7 \\ \hline \end{array}$ |
| 16 | $\begin{array}{r} 204 \\ 22.8 \end{array}$ | $\begin{gathered} 21 \\ 10.3 \end{gathered}$ | $\begin{gathered} 5 \\ 2.5 \end{gathered}$ | $\begin{gathered} 6 \\ 3.0 \end{gathered}$ | $\begin{gathered} 4 \\ 2.0 \end{gathered}$ | $\begin{gathered} 53 \\ 26.0 \end{gathered}$ | $\begin{gathered} 2 \\ 1.0 \end{gathered}$ | $\begin{gathered} 56 \\ 27.5 \end{gathered}$ |
| 17 | 30 3.4 | $\begin{gathered} 5 \\ 17.2 \end{gathered}$ | 二 | 1 3.6 | 二 | $\begin{gathered} 8 \\ 27.6 \end{gathered}$ | － | $\begin{gathered} 9 \\ 30.0 \end{gathered}$ |
| 15.3 | $\begin{array}{r} 893 \\ 100.0 \end{array}$ | $\begin{aligned} & 64 \\ & 7.2 \end{aligned}$ | $\begin{array}{r} 19 \\ 2.1 \end{array}$ | $\begin{aligned} & 31 \\ & 3.6 \end{aligned}$ | $\begin{aligned} & 30 \\ & 3.4 \end{aligned}$ | $\begin{aligned} & 136 \\ & 15.2 \end{aligned}$ | $\begin{aligned} & 5 \\ & 0.6 \end{aligned}$ | $\begin{gathered} 229 \\ 25.6 \end{gathered}$ |



Fig．1．Distribution of risk factors in population of boys $14-17$ years of age from vocational mining schools of the Lublin Coal Basin
(7.2\% of total). In nearly 5\% of the examined boys the CHD risk arise from ECG abnormalities. Rather rare are the cases of hypercholesterolemia or hypertrigliceridemia and overweight which seems to be obvious in such young population.

Because the one, separate risk factor can be accidental, the boys population was divided arbitrarily into two subgroups: the first with low risk of CHD (risk factor 0 or 1 ) and the second, treated as a dyspansering group (risk factors 2 or more). The mean and standard deviation of the examined parameters in the whole students group and in low and high CHD risk subgroups are summarized in Table 3. These data correspond with the risk factors frequency and show that in the high risk group the significant higher body weight, Brocka index, serum cholesterol and trigliceride concentration as well as arterial blood pressure can be stated.

Table 3. Mean value and standard deviation of some physical and biochemical parameters in boys from vocational mining schools of the Lublin Coal Basin

| Parameters | Total |  | Risk group |  |  |  | Significance |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | without or low |  | increased |  |  |
|  | $X$ | SD | $X$ | SD | $X$ | $S D$ | $p$ |
| Number | 893 |  | 797 |  | 96 |  |  |
| Age | 15.3 | 0.5 | 15.3 | 0.5 | 15.4 | 0.6 | ns |
| Body height | 168.8 | 7.2 | 168.5 | 7.3 | 170.2 | 6.8 | ns |
| Body weight | 58.7 | 8.9 | 58.1 | 8.4 | 63.4 | 11.8 | 0.001 |
| Brocka index | 0.854 |  | 0.848 |  | 0.902 |  | 0.001 |
| Cholesterol | 170.2 | 29.3 | 169.2 | 28.1 | 179.5 | 37.8 | 0.010 |
| HDL cholesterol | 51.8 | 8.7 | 51.8 | 9.3 | 52.7 | 9.7 | ns |
| LDL cholesterol | 101.3 | 28.6 | 100.3 | 28.7 | 106.7 | 35.2 | ns |
| LDL/HDL ratio | 2.0 | 0.7 | 1.9 | 0.8 | 2.1 | 0.8 | ns |
| Trigliceride | 86.0 | 36.6 | 84.3 | 34.8 | 100.4 | 52.1 | 0.005 |
| Glucose | 77.4 | 10.8 | 77.3 | 12.2 | 77.5 | 10.7 | ns |
| Uric acid | 5.7 | 1.1 | 5.7 | 1.0 | 5.8 | 1.1 | ns |
| Sys. blood pres. | 118.7 | 13.2 | 117.9 | 12.2 | 126.2 | 18.5 | 0.001 |
| Dias blood pres. | 72.6 | 8.6 | 72.1 | 8.1 | 77.7 | 10.3 | 0.001 |

DISCUSSION
There is no doubt that the following characteristics are significantly and positively associated with the risk of developing CHD: cigarette consumption, hypercholesterolemia and hypertrigliceridemia, systolic and/or diastolic blood pressure, overweight and physical inactivity. Also the genetic risk arising from cardiovascular incidences in family and risk growing with the age should be considered. Some of these risk factors are personally independent (e.g. age and genetic), whereas other can be successfully eliminated or restricted.

It is well known that the CHD incidence occur mainly in men between 40 and 60 years of age (1). Nevertheless, there is some evidence that certain ECG
abnormalities of ischemic type can be found among the young people (2). Thus atherosclerosis becomes also the problem of young age and needs adequate prevention ( 3,10 ). For the preventing strategy of CHD two main questions seem to be important:

1) what methods of initial evaluation of populations would be most valuable for designation of the probability of future CHD development;
2) what kind of intervention and what time of undertaking preventive action would be most effective in respect of CHD incidences decrease.

The continuation of observations of our population in the long-term follow-up study, we hope, will give the possibility for improving the current methods of predicting CHD. But we think that most important is the accurate identification of risk factors especially characteristic of investigated population and on this basis the introduction of the adequate preventive programme. In this respect our results permit to introduce to vocational mining schools of the Lublin Coal Basin the whole intervention programme directed mainly for elimination of smoking, improving of diet and promoting the healthy life-style. On the other hand creating the high risk group of school-boys makes it possible to introduce a secondary prevention methods directed immediately towards the individual risk factors. The evaluation of these programmes will be the subject of our further study.

## Conclusions

1. Among the boys aged $14-17$ years from vocational mining schools of the Lublin Coal Basin the most frequent risk of CHD seems to be the inherited susceptibility arising from frequency of cardiovascular diseases in parents.
2. About $11 \%$ of boys are burdened by more than one risk factor, and they can be treated as a high risk group.
3. The results of investigation indicate that it is necessary to introduce the appropriate prevention programme as early as during the study in vocational schools, especially for eliminating the main risk, e.g. cigarette smoking and diet mistakes.

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## STRESZCZENIE

U 893 uczniów, rozpoczynających naukę w zasadniczych szkołach górniczych Lubelskiego Zagłębia Węglowego, przeprowadzono badania lekarskie i laboratoryjne oceniajace występowanie czynników zagrożenia chorobą niedokrwienną serca. Stwierdzono, że najczę́sciej występującym czynnikiem ryzyka są uwarunkowania genetyczne, polegające na występowaniu chorób układu krazzenia, otyłości lub cukrzycy u rodziców badanych. Innym czynnikiem jest palenie tytoniu - ponad 15\% uczniów w wieku 14-16 lat deklaruje stale palenie papierosów. Graniczne wartości tẹtniczego ciśnienia krwi stwierdzono u $7,2 \%$ badanych, hipercholesterolemię u $3,6 \%$, hipertrójglicerydemię u $3,4 \%$, a u $0,6 \%$ nadwagę zapowiadającą otylość. U 19 chłopców ( $2,1 \%$ ) występowaly zmiany ekg lub objawy sugerujace zmiany ,,niedokrwienne". Na podstawie przeprowadzonych badań opracowano program działań profilaktycznych oraz wyłoniono grupę dyspanseryjna obejmująca 96 uczniów wymagajaccych zwiększonej opieki medycznej.


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