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*Lipid disorders and cardiovascular risk in the population
of women from Lublin*

Lipid disorders are among the cardiovascular risk factors. The unquestionable role of lipid factors in the formation of atheromatous plaque responsible for acute cardiovascular episodes has been proved. Numerous population studies indicate a considerable incidence of lipid disorders which together with other risk factors contribute to the global cardiovascular risk.

The aim of the work was to study the kind and incidence of lipid disorders in the population of women in correlation with other cardiovascular risk factors. Lipid disorders and coexistence of such risk factors as arterial hypertension (AT), cigarette smoking, age, obesity, diabetes, positive family history were analyzed.

MATERIAL AND METHODS

The study included 606 women reporting at the Outpatients' Clinic for Prophylaxis of Cardiovascular Diseases after a local press announcement, as part of the programme for the prophylaxis of circulatory system diseases. 606 women aged 30–60 (average age 47.52 ± 7.24) were examined between 10 September 2000 and 28 February 2001.

In all the patients medical examination, medical history and physical examination were registered in a questionnaire; height and weight were measured, BMI was calculated, ECGs, systolic (RRs) and diastolic (RRd) blood pressure were measured at rest, total cholesterol (TCh), LDL-cholesterol (LDL), HDL-cholesterol (HDL), triglycerides (TG) were determined, taking up blood samples on an empty stomach after 12 h of starvation. Lipidograms were determined by enzymatic method using Bio-Merieux kits. Carbohydrate disorders were determined from the medical history. Statistical work out was done using Statistica 5.0 computer programme. calculations were made using t-Student test, correlations of parametric and nonparametric variables were studied according to Anova test, tau Kendall, Spearman range order, Wilcoxon pair sequence. $P < 0.05$ was assumed as significant.

RESULTS

The studied population of women was divided into 4 groups depending on lipid disorders, using the classification according to the recommendations of III ATP Report. Depending on the LDL cholesterol level. 4 groups of women were distinguished: 1) group of women with optimal LDL cholesterol ($LDL < 100$ mg%), 2) group with LDL close to optimal ($LDL 100–129$ mg%), 3) group with LDL critically raised ($LDL 130–159$ mg%), 4) group with high and very high LDL level – considered together because of a small number ($LDL > 160$ mg%)

Optimal LDL cholesterol level was found in 192 women (31.68%), close to optimal LDL-cholesterol level in 228 women (37.62%), LDL critically raised in 144 women (23.76%), high or very high LDL cholesterol level in 42 (6.93%) women. The average age of women in group 1 was 45.45 ± 6.67 , in group 2: 48.35 ± 6.82 , in group 3: 49.60 ± 6.51 , in group 4: 52.31 ± 6.64 .

The age differences were statistically significant. 1.86% (3) women from group 1, 0.96% (2) women from group 2, 1.55% (2) women from group 3, 15.38% (6) women from group 4 were treated earlier for diabetes. 0.62% (1) women from group 1, 1.91% (4) women from group 2, 2.33% (3) women from group 3, 15.38% (6) women from group 4 had cardiovascular disease earlier diagnosed. Arterial hypertension treated earlier occurred in 19.88% (32) women in group 1, in 18.18% (38) women in group 2, in 20.93% (27) women in group 3 and in 17.95% (7) women in group 4. Positive family history was revealed in 14.58% (28) women from group 1, in 20.61% (47) women from group 2, in 20.14% (29) women from group 3 and in 19.05% (8) women from group 4. Mean values of lipids, systolic and diastolic blood pressure, BMI in LDL groups were shown in Table 1.

Table 1. Mean values of lipids, BMI, systolic and diastolic blood pressure (mm Hg) in the studied groups of patients

	Grup 1	Grup 2	Grup 3	Grup 4
LDL mg%	84.44±12.10	113.80±8.51	142.38±8.09	174.58±14.31
HDL w mg	66.17±18.28	62.28±15.71	61.24±14.03	59.20±11.78
TG mg%	95.32±54.96	103.96±49.34	115.90±45.53	134.24±50.29
RRs mmHg	130.11±19.45	130.66±19.69	134.31±20.48	135.71±22.07
RRr mmHg	82.35±11.90	82.63±11.00	84.15±12.53	85.81±13.67
BMI	25.91	25.94	26.83	26.60

In the studied groups of women statistically significant differences in mean TG values were found. In the group of women with optimal LDL significantly lower (TG – 95.32 mg%) values were observed in comparison with those in groups with LDL critically raised (TG – 115.90 mg%) and high and very high LDL (TG – 134.24 mg%) ($P<0.05$). Similarly, statistically significant differences occurred when comparing mean TG values in the group with LDL critically raised with those in the group with high or very high LDL. Mean values of HDL, RRs, RRd, BMI did not differ in the statistically significant way in the studied groups.

Table 2. The incidence of TG \geq 200 mg%, HDL <40 mg%, arterial hypertension (RRs \geq 140 and/or RRd \geq 90, cigarette smoking habit, menopause, obesity and overweight (BMI $>$ 27)

	Group 1	Group 2	Group 3	Group 4
BMI $>$ 27	28.28% (69)	35.,25% (86)	29.10% (71)	7.38% (18)
TG $>$ 200 mg%	5.49% (13)	9.32% (29)	8.87% (18)	13.21% (7)
HDL $<$ 40 mg%	7.59% (18)	7.40% (23)	5.19% (12)	1.89% (1)
Smoker	28.12% (54)	25.00% (57)	31.95% (46)	30.95% (13)
RRr \geq 140 and/or RRr \geq 90	38.34% (146)	38.59% (176)	47.22% (122)	47.62% (34)
Menopause	38.54% (74)	50.00% (114)	61.1% (88)	73.81% (31)

The differences in the incidence of TG \geq 200 mg% in the studied groups showed the trend (direction) of changes which was close to the statistical significance; they concerned a more frequent appearance of high TG values in LDL groups with higher LDL levels. ($P=0.06$) However, the direction of changes in HDL values showed a more frequent appearance of lower HDL values (HDL $<$ 40 mg%) in the groups with lower LDL levels; the differences were statistically significant ($P<0.05$) (Fig.1).

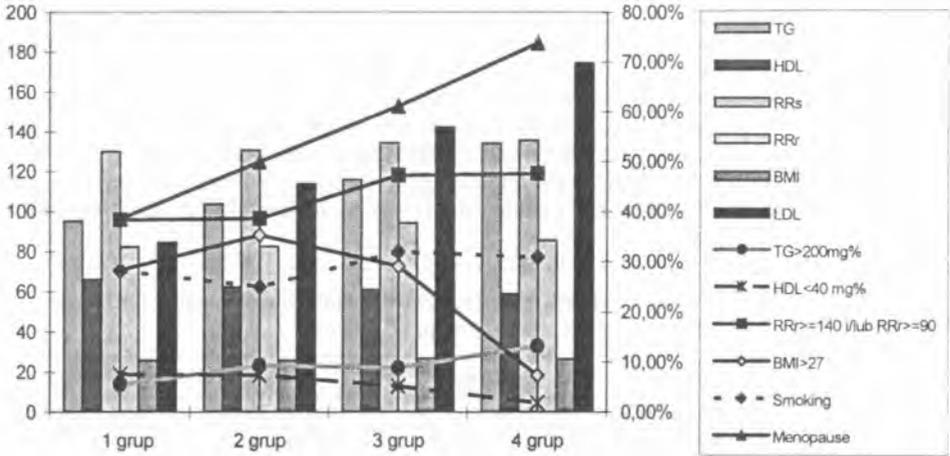


Fig.1. The trend (direction) of changes in LDL groups as regards obesity and overweight (BMI>27), TG values >=200 mg%, HDL <40 mg%, arterial hypertension (RRs>=140 and/or RRd >=90), smoking habit, menopause and mean values of those parameters

The incidence of arterial hypertension did not differ in a statistically significant way in the studied groups, however, Spearman correlation test revealed statistically significant tendencies to a more frequent appearance of arterial hypertension groups in the LDL groups with higher LDL levels (P<0.05) (Fig.1).

In the studied groups of women the direction of changes showed a significantly more frequent occurrence of patients with obesity and overweight (BMI>27) at higher LDL levels (P<0.05) (Fig.1).

Spearman correlation test revealed a more frequent appearance of women after menopause in the groups with higher LDL values (P<0.05) (Fig.1).

DISCUSSION

The coexistence of many cardiovascular risk factors has been frequently reported in the literature and recently, due to the studies on the pathogenesis of atheromatosis, the explanation for the phenomenon can be found in metabolic disorders leading simultaneously to the development of atheromatosis, arterial hypertension, obesity, metabolic syndrome, diabetes (3, 7).

In our population it was shown that in the groups of women with higher LDL values the direction of changes suggests a greater incidence of obesity and overweight (BMI>27), more frequent occurrence of high TG values and low HDL values. The above results suggest a relation of lipid disorders with obesity. Mutual relation of obesity and overweight with lipid disorders was described by many authors. From latest observations it appears that fatty tissue is a secretory tissue, the source of many compounds taking part in the metabolism of carbohydrates and fats, appetite regulation, adrenergic system activity. Those metabolic disorders also contribute to the development of arterial hypertension in obesity (7).

That connection can be related to our population. In LDL groups of higher LDL values statistically significant tendencies were demonstrated to a more frequent appearance of arterial hypertension groups, although mean values of systolic and diastolic blood pressure did not differ in a statistically significant way in the studied groups of women. In people with lipid disorders, obesity, arterial hypertension, i.e. with many endothelium injuring factors, atheromatous changes

in blood vessels are more easily initiated. Treating atheromatosis as an inflammatory process allows to explain the relationship between various risk factors independently of the mechanism of their functioning. It is essential the more so because the injured endothelium is in turn the source of many factors maintaining the inflammatory condition, which releases the vicious circle; breaking up this process becomes difficult (6, 8).

Cigarette smoking is another cardiovascular risk factor we investigated; it concerned 1/3 of the studied patients. A similar frequency was observed in other population studies (POL MONICA BIS WARSAW). Some authors described in smokers higher lipid values in blood, higher levels of LDL fractions and low of HDL ones. (9). In our studies the direction of changes concerned a greater incidence of cigarette smoking in the groups with higher LDL levels.

A tendency to a greater incidence of various risk factors in groups with higher LDL values, observed in our population, increases the risk of an acute cardiovascular episode and requires many-sided activities in their elimination. In her studies Kłosiewicz-Latoszek (3) found a coexistence of many risk factors in 80% of people with obesity. Similarly, other authors observed that obesity increases the risk of developing hypertension, diabetes, lipid disorders (4, 7). The proof of those statements can be the studies of Dobrian et al. on rats, documenting the development of arterial hypertension depending on the diet and accompanying lipid disorders (2).

Spearman correlation test was used to demonstrate the tendencies to change the frequency of developing the cardiovascular disease and diabetes in the LDL groups with higher LDL values in the statistically significant way. The direction of changes showed the increase in the occurrence of cardiovascular disease and diabetes in the groups with higher LDL values, which is in accordance with the common knowledge of a greater incidence of cardiovascular disease at high LDL values and the studies of other authors on the coexistence of many risk factors (1, 2, 5, 7).

CONCLUSIONS

1. The increase of LDL values in women was observed with age.
2. In the studied groups of women with higher LDL values the direction of changes showed a more frequent appearance of high TG values (TG \geq 200), arterial hypertension, obesity and overweight (BMI $>$ 27) and also a higher incidence of cigarette smoking habit.
3. In the studied groups of women with low LDL values a tendency to a simultaneously more frequent appearance of low HDL values (HDL $<$ 40 mg%) was observed.

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SUMMARY

The aim of the work was to evaluate mutual relations of lipid disorders in the population of women. 606 women aged 30–60 reporting as part of the programme for the prophylaxis of circulatory system diseases were examined. Physical examinations and arterial blood pressure measurements were carried out, BMI and lipidograms were determined. Optimal LDL-cholesterol level was found in 192 women (31.68%), close to optimal LDL-cholesterol level in 228 women (37.62%), seriously (critically) elevated in 144 women (23.76%), high or very high level in 42 women (6.93%). HDL-cholesterol < 40 mg% occurred in 18 (7.59%) women with optimal LDL, in 23 (7.40%) women with LDL close to optimal, in 12 (5.19%) women with critically elevated LDL, in 1 woman (1.89%) with high or very high LDL. The trend (direction) of changes shows that HDL values <40 mg% significantly more frequently occur in the groups of women with higher LDL values ($P < 0.05$). The comparison of average TG levels in individual LDL groups showed statistically significant differences between the group of women with optimal LDL 95.32 ± 54.96 mg% compared to that with critically elevated LDL level 115.90 ± 43.53 mg% and high and very high level 134.24 ± 50.29 mg% ($P < 0.05$). $TG \geq 200$ mg% occurred in 13 (5.49%) women with optimal LDL, with LDL close to optimal in 29 (9.32%) women, with LDL critically elevated in 18 (8.87%) women, with high and very high LDL level in 7 (13.21%) women. The differences between the groups of patients were close to statistical significance. The trend (direction) of changes showed a more frequent appearance of high TG values in LDL groups with higher LDL levels ($P = 0.06$). Arterial hypertension occurred in 38.34% women with optimal LDL, in 38.59% women with LDL close to optimal, in 47.22% women with LDL critically elevated, in 47.62% women with high and very high LDL level. Statistically significant tendencies to a more frequent appearance of arterial hypertension groups in LDL groups with higher LDL levels were revealed. Treated earlier for diabetes were 1.86% women with optimal LDL, 0.96% women with LDL close to optimal, 1.55% women with LDL critically elevated, 15.38% women with high and very high LDL. $BMI > 27$ was in 69 (28.28%) women with optimal LDL, 86 (35.25%) women with LDL close to optimal, 71 (29.10%) women with critically elevated LDL, 18 (7.38%) women with high and very high LDL. The trend (direction) of changes indicated a significantly more frequent appearance of $BMI > 27$ in LDL groups with higher LDL values. In LDL groups with higher LDL concentrations significant changes were observed in the more frequent appearance of low HDL values, more frequent appearance of arterial hypertension groups of higher values, BMI above 27, elevated TG values.

Zaburzenia lipidowe a inne czynniki ryzyka wieńcowego w badaniach populacji kobiet Lublina

Celem pracy była ocena wzajemnych relacji zaburzeń lipidowych w populacji kobiet. Zbadano 606 kobiet w wieku 30–60 lat zgłaszających się w ramach programu profilaktyki chorób układu krążenia. Przeprowadzono badanie lekarskie, pomiar ciśnienia tętniczego krwi, obliczono BMI, oznaczono lipidogram. Stwierdzono poziom cholesterolu LDL optymalny u 192 (31,68%) kobiet, LDL bliski optymalnemu u 228 (37,62%), LDL granicznie podwyższony u 144 (23,76%),

LDL wysoki lub bardzo wysoki u 42 (6,93%). Cholesterol HDL <40mg% występował u 18 (7,59%) z LDL optymalnym, u 23 (7,40%) z LDL bliskim optymalnemu, u 12 (5,19%) z LDL granicznie podwyższonym, u 1 (1,89%) z LDL wysokim i bardzo wysokim. Kierunek zmian wskazuje, że wartości HDL < 40 mg% występują istotnie częściej w grupach kobiet z wyższymi wartościami LDL ($P<0,05$). Porównanie średnich poziomów TG w poszczególnych grupach LDL wykazało istotne statystycznie różnice między grupą kobiet z LDL optymalnym $95,32\pm 54,96$ mg% w porównaniu z granicznie podwyższonym $115,90\pm 43,53$ mg% oraz wysokim i bardzo wysokim $134,24\pm 50,29$ mg% ($P<0,05$). TG ≥ 200 mg% występowały u 13 (5,49%) kobiet z LDL optymalnym, z LDL bliskim optymalnemu u 29 (9,32%), z LDL granicznie podwyższonym u 18 (8,87%), z LDL wysokim i bardzo wysokim u 7 (13,21%). Różnice między grupami chorych były bliskie istotności statystycznej. Kierunek zmian wskazywał na częstsze pojawianie się wysokich wartości TG w grupach LDL o wyższych poziomach LDL ($P=0,06$). Nadciśnienie tętnicze występowało u 38,34% kobiet z LDL optymalnym, z LDL bliskim optymalnemu u 38,59%, z LDL granicznie podwyższonym u 47,22%, z LDL wysokim i bardzo wysokim u 47,62%. Wykazano istotne statystycznie tendencje częstszego pojawiania się grup nadciśnienia tętniczego w grupach LDL o wyższych poziomach LDL. Z powodu cukrzycy leczono się wcześniej 1,86% kobiet z LDL optymalnym, z LDL bliskim optymalnemu 0,96%, z LDL granicznie podwyższonym 1,55%, z LDL wysokim i bardzo wysokim 15,38% kobiet. BMI >27 miało 69 (28,28%) kobiet z LDL optymalnym, z LDL bliskim optymalnemu 86 (35,25%), z LDL granicznie podwyższonym 71 (29,10%), z LDL wysokim i bardzo wysokim 18 (7,38%) kobiet. Kierunek zmian wskazywał na istotnie częstsze pojawianie się BMI >27 w grupach LDL o wyższych wartościach LDL. Wnioski: W grupach LDL o wyższych stężeniach LDL obserwowano istotne zmiany w kierunku częstszego pojawiania się niskich wartości HDL, częstszego pojawiania się wyższych grup nadciśnienia tętniczego, BMI powyżej 27, podwyższonych wartości TG.