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Lipids profile and some anthropometric measurements in diabetic and non-diabetic peritoneal dialysis patients

In chronic renal failure some lipid disturbances are observed even in early stage of the disease (2, 4, 5, 9). They are characterized mainly by elevated plasma levels of total cholesterol and triglycerides (1, 5). The other disturbance which occurs in renal failure is an abnormal level of apolipoprotein (3). The intensification of described plasma lipids disturbances is raising with the progress of the disease. Renal dyslipidemia was first described in hemodialyzed patients (1), but some abnormalities in lipid profile are observed in peritoneal dialyzed patients as well (4, 9). Dialysis can moderately attenuate dyslipidemia, but its character remains unchanged.

The aim of our study was to evaluate the dependence between dyslipidemia and some anthropometric measurements in diabetic and non-diabetic peritoneal dialysis patients (PD-pts).

MATERIAL AND METHODS

Our study was performed on 51 patients: 28 women and 23 men, treated by chronic peritoneal dialysis: continuous ambulatory peritoneal dialysis (CAPD) or automatic peritoneal dialysis (APD). The duration of peritoneal dialysis time was between 4 and 87 months. The study was performed on patients without clinical symptoms of active inflammatory process. The patients were divided into two groups: I – non-diabetic patients (34 pts) and II – diabetic patients (17 pts). In group I there were 18 women and 16 men, age from 27 up to 77 years (mean age 48.65±17.72 years). Dialysis time in this group was 5 up to 86 months (mean time 35.35±23.55 months). In group II there were 10 women and 7 men, age 30 up to 74 years (mean age 55.12±13.82 years), time of dialysis was between 4 and 87 months (average time 28.23±23.77 months).

In both groups we determined the lipid profile: serum concentration of total cholesterol (TC), high density lipoprotein (HDL), low density lipoprotein (LDL), triglycerides (TG) and lipoprotein (a) (Lp(a)) were measured. Some anthropometric measurements were also performed. Serum concentration of total cholesterol was estimated colorimetricaly using the enzymatic method (CHOD-PAP kid, Roche). TG and HDL levels were determined, using kits of the Roche Diagnostic System. HDL level was calculated using Friedewald's formula, whilst Lp(a) serum level was determined by electroimmunodiffusion using a commercial kit Sebia. In every patient some anthropometric measurements were obtained. In order to minimalize variability in the anthropometric measurements all of them were performed by a single investigator. We determined such anthropometric measurements

as: body weight (BW), body height (BH), body mass index (BMI), mid-arm circumference at rest and in tension (MAC-r and MAC-t), upper limb length (ULL), triceps (TSF), axilla (ASF), subscapular (SSF) and suprailiaca (SISF) skinfolds thickness. We also calculated: the upper limb musculature index (ULMI), total body water (TBW), lean body mass (LBM), and fat body mass (FBM). Body weight was determined by using the electronic balance. Body height was measured by using an anthropometer. Mid-arm circumference at rest and in tension (MAC-r and MAC-t) were measured with a flexible steel tape on the right arm. The musculature of upper limb index (ULMI) was evaluated as: maximal arm circumference in tension – maximal arm circumference at rest/upper limb length x 100. BMI was calculated as: body weight/body height square (7). TBW was estimated from Watson and Watson formula (10); LBM was estimated as LBM=TBM/0.73, whilst FBM was calculated as the difference between TBM and LBM (6, 7). Triceps (TSF), axilla (ASF) subscapular (SSF) and suprailiaca (SISF) skinfolds thickness were measured with skinfold caliper on the right side of the body (7). Obtained values were statistically analyzed using U Mann-Whitney's and Spearman's correlation tests.

RESULTS

Obtained values of anthropometric measurements and biochemical parameters of lipids are shown in Tables 1 and 2 as mean values ± SD. In both examined groups mean value of total cholesterol was higher than referenced value: 224.57±57.63 mg/dl versus 236.74±58.89 mg/dl (normal value 130–200 mg/dl), also TG level was higher than normal value (<150 mg/dl): 199.81±97.48 mg/dl in group I versus 229.37±152.8 mg/dl in group II. LDL serum concentration was elevated in both groups and its mean value was higher than normal: 134.48±47.69 mg/dl in group I versus 126.47±39.46 mg/dl in group II (normal value <100 mg/dl). HDL mean value in group I was 46.53±13.25 mg/dl, whilst in group II was higher: 51.06±16.87 mg/dl (normal value >55 mg/dl for men and > 65 mg/dl for women). Lp(a) serum concentration was in non-diabetic group on the level 57.98±48.2 mg/dl, whilst in diabetic group mean value was 67.53±56.76 mg/dl (normal value 4–30 mg/dl).

Although lipid values in both groups were elevated in relation to normal values (except the value of HDL, which was in both group lower than recommended values), they do not differ statistically between the examined groups.

When absolute values of the examined lipid parameters were compared between both groups, we observed higher than normal values of total cholesterol in 26 from 34 (76.47%) patients in group I vs 16 from 17 (94.12%) patients in group II; Tg value was higher than normal value in 23 from 34 (67.65%) pts (group I) vs 14 from 17 (82.35%) pts (group II). LDL higher than the recommended value was observed in 94.12% patients from both groups (32 /34 in group I vs 16/17 in group II). Also the same percentage of patients with abnormal Lp(a) level in both groups was observed: 52.94% patients (18 from 34 in group I vs 9 from 17 in group II) had higher than recommended Lp(a) serum level. It is interesting that larger disturbances in HDL abnormal value was observed in group I than in group II: 30 from 34 pts in group I (88.47%) vs 10 from 17 (58.82%) pts had HDL value lower than the recommended one.

Our data showed that there is no differences between both groups: I – non-diabetic patients and II – diabetic patients in such parameters as: body weight, age, or time of dialysis.

Performed statistical analysis by using non-parametric U Mann-Whitney's test for independence variables showed statistically significant differences ($p<0.05$) between both groups in values of MAC-r, MAC-t, SSF, ASF and ULMI. No statistically significant differences between both groups in values of TC, TG, HDL, LDL and Lp(a) were found. Statistical analysis made by using Spearman's

test showed a positive correlation ($p<0.05$) between patients' age and MAC-r, TSF, ULMI, TC; between subscapular skinfold thickness (SSF) and TBW, LBM; between axilla skinfold thickness (ASF) and TBW, LBM, FBM, ULMI; between total body water (TBW) and fat body mass (FBM); between mid-arm circumference at rest and in tension (MAC-r and MAC-t) and BMI, TBW, LBM, FBM, ULMI; between body weight (BW) and SSF, SSSF, BMI, TBW, FBM, as well as between total cholesterol (TC) and HDL; LDL and TG. We also found a negative correlation between time of dialysis, and body height (BH), body weight (BW), total body water (TBW), lean body mass (LBM) and fat body mass (FBM).

Table1. Anthropometric measurements in PD-pts: mean value ±SD

	Time of dialysis (months)	Age (years)	Body height (cm)	Body mass (kg)	MAC-r (x0.1mm)	MAC-t (x0.1mm)	SSF (x0.1mm)
GRUPA I	35.35± 23.55	48.65± 17.72	167.45± 19.89	73.19± 19.1	29.0± 4.79	29.98± 4.5	143.93± 84.72
GRUPA II	28.23± 23.77	55.12± 13.82	163.06± 8.87	80.25± 19.02	31.91± 4.26	32.68± 4.26	221.05± 92.61

TSF (x0.1mm)	SISF (x0.1mm)	ASF (x0.1mm)	BMI (kg/m^2)	TBW (kg)	LBM (kg)	FBM (kg)	ULMI (%)
144.05± 83.65	136.23± 68.39	66.44± 54.0	29.68± 20.48	38.87± 17.39	49.77± 9.82	22.36± 11.75	39.3± 6.75
180.94± 87.53	176.47± 89.47	73.65± 35.3	29.97± 5.57	38.19± 8.4	52.32± 11.5	27.93± 10.37	43.21± 4.86

Group I – non-diabetic patients; Group II – diabetic patients; MAC-r – mid-arm circumference at rest, MAC-t – mid-arm circumference in tension, SSF – subscapular skinfold thickness, TSF – triceps skinfold thickness, SISF – suprailiaca skinfold thickness, ASF – axilla skinfold thickness, BMI – body mass index, TBW – total body water, LBM – lean body mass, FBM – fat body mass, ULMI – upper limb musculature index

Table 2. Mean value ± SD of serum TC, HDL, LDL, TG and Lp(a) level

	TC (mg%)	HDL (mg%)	LDL (mg%)	TG (mg%)	Lp(a) (mg%)
Group I	224.57± 57.63	46.53± 13.25	134.48± 47.69	199.81± 97.48	57.98± 48.2
Group II	236.74± 58.89	51.06± 16.87	126.47± 39.46	229.37± 152.8	67.53± 56.76

Group I – non-diabetic patients; Group II – diabetic patients, TC – total cholesterol, HDL – high density hipoprotein, LDL – low density lipoprotein, TG – triglycerides, Lp(a) – lipoprotein (a) (Lp(a))

DISCUSSION

Renal dyslipidemia first described in hemodialysis patients is observed in patients undergoing peritoneal dialysis, as well as in patients suffering from chronic renal failure. Until now renal participation in lipid profile disturbances is not finally known (1). Attman et al. observed that hemodialysis can moderately attenuate the renal dyslipidemia, whilst peritoneal dialysis is associated with further lipid profile disturbances aggravation (1). In the present study we examined some peritoneal dialysis patients in order to determine not only their lipid profile but also some anthropometric measurements.

Many authors observed some lipid disturbances in patients suffering from progressive renal failure and in dialyzed patients (2, 4, 5, 9). It is usually characterized by increased serum concentration of triglycerides, VLDL and LDL (1, 5). Kronenberg et al. suggested that dyslipidemia occurs even

more often in PD than in HD patients (4). Soreide noticed some body composition disturbances in PD patients: they seem to accumulate during peritoneal dialysis treatment fat (9). Johansson also confirmed that PD patients had fundamentally altered body composition compared to healthy subjects (2). Kimak et al. observed in their study increased concentration of TG, TC, LDL as well as higher serum concentration of Lp(a) in PD patients than in HD patients (3). We also affirmed in the present study higher values of TC, TG and LDL in both observed groups than recommended values. Saltissi et al. observed that using a lipid-lowering diet in dialyzed patients caused that only 24.4% HD patients and 15.4% PD patients normalized their lipid levels (8). It seems to be necessary using some medicines in order to improve lipid profile in dialyzed patients, particularly in PD patients. Although it seems we know a lot of lipid profile disturbances, some other studies are needed to determine disturbances in body composition in dialyzed patients.

CONCLUSIONS

In the present study we did not observe any statistically differences between examined groups in the lipid profile, although in both groups elevated values of total cholesterol, triglycerides, and low density lipoprotein as well as lower HDL level in relation to normal values were observed. As regards anthropometric measurements we noticed statistically significant differences between both groups in values of MAC-r, MAC-t, SSF, ASF and ULMI; the mean values of these parameters were higher in the diabetic patients group.

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SUMMARY

In chronic renal failure some lipid disturbances are observed even in early stage of the disease. Their intensification is raising with the progress of the disease. Dialysis can moderately attenuate dyslipidemia, but its character remains unchanged. The aim of the study was to evaluate the dependence between dyslipidemia and some anthropometric measurements in diabetic and non-diabetic peritoneal dialysis patients (PD-pts). The study was performed on 51 PD-pts treated APD or CAPD. Patients were divided into two groups: I – non-diabetic patients (34 pts) and II – diabetic patients (17 pts). In both groups we determined total cholesterol (TC), high density lipoprotein (HDL), low density lipoprotein (LDL), triglycerides (TG), lipoprotein(a) (Lp(a)); we also determined body weight (BW), body height (BH), body mass index (BMI), mid-arm circumference at rest and in tension (MAC-r and MAC-t), upper limb length (ULL), triceps (TSF), axilla (ASF), subscapular (SSF) and suprailiaca (SISF) skinfolds thickness, as well as total body water (TBW), lean body mass (LBM), fat body mass (FBM) and upper limb musculature index (ULMI). The results were statistically analyzed using U Mann-Whitney's test and Spearman's correlation test. No statistically significance differences between the examined groups in lipid values were observed. We observed statistically significant differences between both groups in MAC-r , MAC-t, SSF and ULMI values. There were present positive correlations between patients' age and MAC-r, TSF, ULMI, TC, BMI, FBM; SSF and TBW, LBM; ASF and TBW, LBM, TFM, ULMI; TBW and FBM; MAC-r and MAC-t and BMI, TBW, LBM, FBM, ULMI; body weight and SSF, SSSF, BMI, TBW, FBM, as well as TC and HDL; LDL and TG. Negative correlation between duration of dialysis and body height, body weight, TBW, LBM, FBM were observed. Conclusion: no statistically significant differences in the lipid profile but only some differences in anthropometric measurements between both groups were observed.

Profil lipidowy a niektóre pomiary antropometryczne u pacjentów z cukrzycą i bez cukrzycy dializowanych otrzewnowo

W przewlekłej niewydolności nerek już we wczesnych stadiach obserwuje się zaburzenie gospodarki tłuszczowej. Ich nasilenie postępuje w miarę rozwoju choroby. Dializowanie może nieznacznie modyfikować nasilenie dyslipidemii, ale sam charakter zaburzeń pozostaje bez zmian. Celem badania było określenie zależności między zaburzeniami gospodarki lipidowej a niektórymi parametrami antropometrycznymi u pacjentów z cukrzycą i bez cukrzycy dializowanych otrzewnowo. Badania przeprowadzono na 51 pacjentach dializowanych otrzewnowo: automatyczną dializą otrzewnową lub ciągłą ambulatoryjną dializą otrzewnową. Pacjentów podzielono na dwie grupy: I – chorzy bez cukrzycy (34 pacjentów) i II – chorzy z cukrzycą (17 pacjentów). W obu grupach oznaczono poziom cholesterolu całkowitego (TC), lipoprotein o dużej gęstości (HDL), lipoprotein o małej gęstości (LDL), trójglicerydów (TG) oraz lipoproteidy (a) (Lp(a)) oraz masę ciała (BW), wzrost (BH), indeks masy ciała (BMI), pośrodkowy obwód ramienia w spoczynku i w napięciu (MAC-r i MAC-t), długość kończyny górnej (ULL); grubość fałdów mięśniowo-skórnych: nad mięśniem trójgłowym ramienia (TSF) pachowego (ASF), podłopatkowego (SSF), nad kolcem biodrowym przednim górnym (SISF); oznaczono także całkowitą wodę ustroju (TBW), całkowitą masę beztłuszczową (LBM) i całkowitą masę tłuszczową (FBM) oraz wskaźnik umięśnienia kończyny górnej (ULMI). Uzyskane wartości zostały poddane analizie statystycznej testem U Mann-Whitney i testem korelacji Spearmana. Nie wykazano istotnych statystycznie różnic między grupami w zakresie gospodarki lipidowej. Zanotowano statystycznie istotne różnice pomiędzy obiema badanymi grupami w zakresie MAC-r ,

MAC-t, SSF i ULMI. Była natomiast pozytywna korelacja pomiędzy wiekiem pacjentów a MAC-r, TSF, ULMI, TC, BMI, FBM; grubością fałdu podłopatkowego (SSF) i TBW, LBM; grubością fałdu pachowego (ASF) a TBW, LBM, TFM, ULMI; całkowitą wodą ustroju (TBW) a FBM; pośrodkowym obwodem ramienia w spoczynku i w napięciu (MAC-r i MAC-t) a BMI, TBW, LBM, FBM, ULMI; masą ciała a SSF, SSSF, BMI, TBW, FBM, oraz między TC a HDL, LDL a TG. Obserwowano ujemną korelację pomiędzy czasem trwania dializoterapii a masą ciała, wzrostem, TBW, LBM i FBM. W naszym badaniu nie stwierdzono istnienia istotnych statystycznie różnic w zakresie profilu lipidowego, a jedynie pewne różnice w zakresie wartości parametrów antropometrycznych pomiędzy badanymi grupami.