Microalbuminuria in Type 2 Diabetic Patient with Hypertension

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ABSTRACT

The prevalence of microalbuminuria (MAU) was determined in type 2 diabetic patients with hypertension attending at the Outpatient Department from October 2002 to November 2003. Nephur® tests were performed in all cases to detect macroalbuminuria. Patients without any documented urinalysis or those with normoalbuminuria tested previously were enrolled. Demographic and clinical data were collected through questionnaires. Micral® tests were subsequently carried out in those who did not have macroalbuminuria. A hundred males (aged of 59.3 ± 11.0 years) and 200 females (aged of 60.3 ± 10.1 years) were enrolled with the mean BMI of 27.3 ± 4.3 kg/m^2 (26.9 ± 4.1 kg/m^2 in males and 27.6 ± 4.4 kg/m^2 in females). It was found that he prevalence of macroalbuminuria was 7.3% (22/300), 10% in males and 6% in females (p = 0.78), while the prevalence of MAU was 40.7% (113/278), 48.9% in males and 36.7% in females (p = 0.0001). There was no significant differences between patients with normoalbuminuria and those with MAU in age, sex, ethnic, BMI, levels of BP, fasting plasma glucose, glycosylated hemoglobin, creatinine, LDL-C, HDL-C, including the rate of BP normalization recommended by ADA 2003 guidelines and the use of ACE inhibitors or angiotensin receptor blockers. The prevalence of MAU rose in relation with the duration of diabetes of 1 to 5 years (35.5%), >5 to 10 years (50.0%), and > 10 years (63.2%) as well as with an increase in duration of hypertension, i.e. 1 to 5 years (36.0%), > 5 to 10 years (42.0%), and > 10 years (51.0%). Average number of antihypertensive drugs taken was 2.5 ± 1.1 to keep the mean BP of 137.5 ± 12.3/80.6 ± 7.8 mm Hg.

Keywords: Diabetes mellitus; hypertension; microalbuminuria

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Microalbuminuria (MAU) is an early indicator of diabetic nephropathy.[1] The present of it correlated with an increase risk of ischemic heart disease, left ventricular hypertrophy, generalized endothelial dysfunction, carotid atherosclerosis, and total mortality.[2-6] When diabetes mellitus is found in associated with hypertension (HT), cardiovascular risk is amplified.[7] Recent statistics from the World Health Organization forecast a vast increase in the prevalence of diabetes mellitus, worldwide, especially in Asia, which accounts for approximately two-thirds of the global data.[8] Furthermore, a cross sectional survey of 3,357 patients with diabetes mellitus in 1998 among Asian populations revealed a 39% prevalence of MAU regardless of blood pressure status.[9] Since, there was no data of MAU among type 2 diabetic patients with hypertension in Thailand, therefore this study was carried out at the Outpatient Clinic, Siriraj Hospital from October 2002 to November 2003.

Objective

To find the prevalence of MAU as well as the cardiovascular risks among type 2 diabetic patients with hypertension attended at the Outpatient Department, Siriraj Hospital. The rate of blood pressure normalization (BP < 130/80 mm Hg), glycemic control (HbA_{1C} < 7.0%), and lipemic control (Low density lipoprotein, LDL-cholesterol < 100 mg/dl, Triglyceride, TG < 150 mg/dl, High density lipoprotein, HDL-cholesterol > 40 mg/dl in males and > 50 mg/dl in females) were also examined.

MATERIALS AND METHODS

Study design

A cross-sectional survey was carried out between October 2002 and December 2002 on ambulatory type 2 diabetic hypertensive patients of both sex, aged 18 years, attended at General Medicine clinic and Hypertension clinic of Siriraj Hospital. Medical records were carefully reviewed whether they had been tested for proteinuria. If they have not been tested or their previous urinalysis showed no proteinuria, they were enrolled. After verbal consents were given, questionnaires were filled up by the investigators. It contained demographic data, smoking habit, current medical illnesses, family and personal history of diabetes mellitus, hypertension, renal diseases, and cardiac diseases. Participants were examined for weight,

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height, waist and hip circumference. The duration and the onset of hypertension together with diabetes mellitus, current treatment, diabetic and cardiovascular complications were obtained. The recent glycemic, lipemic and blood pressure (BP) control were also recorded. In the mean time, all patients were asked to rest in supine position for 5 minutes. A series of office BP's, SBP (Korotkoff I) and DBP (Korotkoff V), were measured two times at 5-minute-intervals while supine with a well-calibrated mercury sphygmomanometer and were averaged. Cigarette smoking and beverages containing caffeine or alcohol were prohibited for at least 2 hours before BP measurements.

HT was defined by history and the use of antihypertensive medications. Patients with a mean supine diastolic BP (DBP) of 90 mm Hg and/or mean systolic BP (SBP) of 140 mm Hg were also considered eligible for the study if no antihypertensive drug was currently given. Adequacies of glycemic as well as hypertensive control were defined according to the American Diabetes Associations (ADA): Clinical Practice Guidelines and Recommendations 2006.[10] Whereas, adequacy of lipemic control and metabolic syndrome were defined according to the Executive Summary of the Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (ATP-III).[11] Obesity and overweight were defined according to the WHO Guidelines.[12] Major exclusions were known or suspected secondary HT, significant cardiovascular i.e. congestive heart failure, and renal/hepatic impairments. We also excluded patients who had established kidney disease previously and those who had symptoms of urinary tract infection, as well as patients who had leukocyturia > 5/HPF on the examining day. In addition, patients with fever, sleep apnea, or heavy exercise were excluded.

After an enrollment, overnight or morning urine will be collected. Nephur® test (Roche Diagnostics GmbH, Mannheim, Germany) was initially performed in all patients by a well-trained technician. A semi-quantitative urinary dipstick-method, Micral® test (Roche Diagnostics GmbH, Mannheim, Germany), was subsequently carried out in those who did not have macroalbuminuria. Subjects were then divided into 3 groups: normoalbuminuria (negative Nephur® test plus negative Micral® test), MAU (negative Nephur® test plus positive Micral® test), and overt proteinuria (positive Nephur® test).

TABLE 1. Clinical and biochemical characteristics of the studied subjects.

Parameter	All (N = 300)	Normoalbuminuric group (n = 165)	Microalbuminuric group (n = 113)	Overt-proteinuric group (n = 22)
Age (years)	60.0±10.4	60.2±10.7	59.8±10.2	60.7±9.9
Number of female patients	200	119	69	12
Number of male patients	100	46	44	10
Weight (kg)	67.9±12.5	66.3±11.6	69.6±12.7	71.0±17.1
BMI (kg/m^2)	27.3±4.3	26.8±4.1	27.7±4.0	29.0±6.3
Waist (cm)	90.8±9.7	89.3±9.3	92.4±10.1	93.6±9.3
Hip (cm)	102.7±8.4	102.7±8.0	10.37±8.7	103.0±9.8
Waist/hip ratio	0.88±0.08	0.87±0.06	0.89±0.07	0.87±0.18
SBP (mm Hg)	137.5±12.3	136.4±11.6	138.7±13.5	139.9±10.3
DBP (mm Hg)	80.6±7.7	79.3±6.9	81.7±8.4	84.5±8.7
Number of patients with BP-normalization (%)	46 (15.3%)	28 (17.0%)	16 (14.2%)	2 (9.1%)
FBS (mg/dl)	142.0±36.2	139.6±32.9	141.8±34.6	160.8±58.4
HbA_{1C} (%)[1]	7.0±1.2	7.1±1.1	6.9±1.1	7.5±1.5
Number of patients with $HbA_{1C} < 7.0\%$[1] (%)	172/289 (59.5%)	103/159 (64.8%)	61/109 (56.0%)	8/21 (38.1%)
Creatinine (mg/dl)	0.95±0.5	0.93±0.6	0.96±0.4	0.94±0.5
Total cholesterol (mg/dl)[2]	212.8±43.3	211.0±46.5	216.4±40.0	208.5±33.2
Number of patients with cholesterol <200 mg/dl[2] (%)	125/294 (42.5%)	74/164 (45.1%)	41/110 (37.3%)	10/20 (50.0%)
Triglyceride (mg/dl)[3]	176.4±87.8	173.6±86.1	175.4±90.4	204.7±86.2
Number of patients with triglyceride <150 mg/dl[3] (%)	134/287 (46.7%)	76/158 (48.1%)	52/108 (48.2%)	6/20 (30.0%)
HDL-cholesterol (mg/dl)[4]	49.0±11.2	49.7±11.0	48.8±11.9	44.5±8.8
Number of patients with HDL-C >40 mg/dl[4] (%)	201/269 (74.7%)	117/150 (78.0%)	72/98 (73.5%)	12/21 (57.1%)
LDL-cholesterol (mg/dl)[4]	128.3±40.6	126.2±41.6	132.6±40.3	122.9±32.4
Number of patients with LDL-C <100 mg/dl[4] (%)	68/269 (25.3%)	41/150 (27.3%)	20/100 (20.0%)	7/19 (36.8%)
Duration of HT (years)	7.0±5.2	6.6±4.8	7.8±5.4	6.5±4.5
Duration of DM (years)	4.7±3.8	4.4±3.8	5.9±4.9	5.2±4.2
Average number of anti-hypertensive drugs used	2.5±1.1	2.5±1.1	2.5±1.0	2.0±0.9

[1]of 289 patients, 96.3% of the analyses population
[2]of 294 patients, 98.0% of the analyses population
[3]of 287 patients, 95.7% of the analyses population
[4]of 269 patients, 89.7% of the analyses population

TABLE 2. Prevalence of risk factors in the studied volunteers.

Risk factor	Positive (%) All (n = 300)	Normoalbuminuric group (n = 165)	Microalbuminuric group (n = 113)	Overt proteinuric group (n = 22)
Current smoker	6.7	6.1	6.2	13.6
Previous smoker	12.0	9.7	15.0	13.6
Male 45 year or female 55 years	33.0	73.3	76.1	72.7
Obese (BMI >30 kg/m^2)	22.3	20.0	25.7	22.7
Overweight (BMI > 25 kg/m^2)	56.3	56.8	64.3	88.2
Hypercholesterolemia	56.3	54.6	61.1	45.5
Low HDL-Cholesterol	33.0	29.1	33.3	45.5

TABLE 3. Number of risk factors present in the studied volunteers.

Parameter	All (n = 300)	Normoalbuminuric group (n = 165)	Microalbuminuric group (n = 113)	Overt proteinuric group (n = 22)
2 risks	15.3	18.2	13.3	4.6
3 risks	58.3	58.2	57.5	63.6
4 risks	23.7	21.1	26.6	27.3
5 risks	2.7	2.4	2.7	4.6

Statistical analyses

Results were demonstrated as mean ± standard deviation (SD) or percent (%) where appropriate. Statistical analyses were performed using Statistical Packages for Social Sciences (SPSS 9.0). Student's t-test and Chi-square test were used to compare the continuous and categorical data between the normoalbuminuria and MAU, respectively. In order to identify the risk independently associated with the occurrence of MAU, multivariate analyses were performed to adjust the confounding effects of other factors. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 300 hypertensive patients with type 2 diabetes mellitus were studied cross-sectionally for the presence of albuminuria, and other associated risk factors. There were a hundred males (aged of 59.3 ± 11.0 years) and 200 females (aged of 60.3 ± 10.1 years) enrolled with the mean BMI of 27.3 ± 4.3 kg/m^2 (26.9 ± 4.1 kg/m^2 in males and 27.6 ± 4.4 kg/m^2 in females). The mean BP levels were 137.5 ± 12.3/80.6 ± 7.7 mm Hg (136.3 ± 11.8/81.9 ± 7.5 mm Hg in males and 138.1 ± 12.5/80.0 ± 7.9 mm Hg in females) (Table 1).

The mean duration of diabetes was 4.7±3.8 years and hypertension was 7.0 ± 5.2 years (ranged 3 months to >20 years in both groups). The association of proteinuria status and risk factors was demonstrated (Table 2 and 3). Less than 10% of the studied volunteers are current smokers. A quarter had low HDL-cholesterol levels while more than half had hypercholesterolemia. Nearly 80% of them were overweight to obese. Two hundred and fifty four diabetic hypertensives (84.7%) had at least one or more added risks. From outpatient patient files reviewed, 13 patients had diabetic retinopathy, 4 patients had peripheral neuropathy, 2 patients had a history of transient ischemic attacks, and 5 patients had stroke, previously. None of them had histories of myocardial infarction, angina pectoris, congestive heart failure, peripheral arterial disease, or other neuropathies.

Of the 300 patients, 295 (98.3%) were treated with antihypertensive drugs, whereas five (1.7%) were solely on non-pharmacological interventions. Monotherapy was prescribed for 52 (17.3%), and combinations for 243 (81%) patients. Of these, two-drug in 98 (32.7%), three-drug in 92 (30.7%), four-drug in 46 (15.3), and five or more drugs in 7 (2.3%) were used (Table 4). Average number of antihypertensive drugs taken was 2.5 ± 1.1.

The extent of BP control achieved in these patients was shown (Table 5). The recommended target BP of < 130/< 80 mm Hg was achieved in 46 (15.3%). In the uncontrolled group (BP > 130/> 80 mm Hg), there were 143 patients (47.7%). In the fairly controlled group, 85 patients (28.3%) had a high SBP and a normal DBP (130/< 80 mm Hg) whereas 26 patients (8.7%) had a normal SBP and a high DBP (<130/ 80 mm Hg). Finally, there were only 46 volunteers (15.3%) achieved target BP. Out of them, 15 volunteers (32.6%) achieved target BP with monotherapy (Table 6).

Type of antihypertensive drug usage was observed, calcium channel blocker (CCB) (62.3%) was the most frequently prescribed antihypertensive drug followed by diuretic (55.0%) and β-blocker (53.7%)

TABLE 4. Antihypertensive drug therapy and non-pharmacological interventions vs. SBP and DBP levels in diabetic hypertensives.

Drug therapy	N (%)	SBP (mm Hg)	DBP (mm Hg)
Monotherapy	52 (17.3)	132.4±10.6	80.2±7.2
Two-drug combinations	98 (32.7)	138.3±12.4	82.3±9.0
Three-drug combinations	92 (30.7)	138.2±12.9	80.0±6.8
Four-drug combinations	46 (15.3)	140.3±11.1	79.5±7.1
Five or more drug combinations	7 (2.3)	140.7±14.7	76.3±6.9
Non-pharmacological interventions	5 (1.7)	133.2±11.3	78.2+8.4
All	300 (100.0)	137.5±12.3	80.6+7.8

Data are mean ± SD; values in parenthesis represent the percentage of antihypertensive therapy.

TABLE 5. Blood pressure patterns in treated diabetic hypertensives.

Category		N (%)
Well controlled	(< 130/80 mm Hg)	46 (15.3)
Fairly controlled	(130/< 80 mm Hg)	85 (28.3)
	(< 130/ 80 mm Hg)	26 (8.7)
Uncontrolled	(130/ 80 mm Hg)	143 (47.7)

TABLE 6. Type of antihypertensive therapy and blood pressure (BP) pattern in diabetic hypertensives.

Antihypertensive therapy	N	<130/<80 mm Hg	≥130/<80 mm Hg	<130/≥80 mm Hg	≥130/≥80 mm Hg
Monotherapy	52	15 (28.3)	8 (15.1)	5 (9.4)	24 (45.3)
Drug combinations	243	30 (12.3)	75 (30.9)	20 (8.2)	118 (48.6)
Non-pharmacological therapy	5	1 (20.0)	2 (40.0)	1 (20.0)	1 (20.0)
Total	300	46 (15.3)	85 (28.3)	26 (8.7)	143 (47.7)

TABLE 7. Antihypertensive drugs used in diabetic hypertensives.

Type of antihypertensive drug	N (%) (n = 300)
CCB	187 (62.3%)
Diuretic	165 (55.0%)
β-blocker	161 (53.7%)
ACE inhibitor	125 (41.7%)
ARB	60 (20.0%)
α-blocker	42 (14.0%)

TABLE 8. HbA_{1C} levels and the frequency of MAU (excluding 22 cases of macroalbuminuria).

	HbA_{1C} <7%	7% HbA_{1C} 8%	HbA_{1C} >8%	p-value
Number of patient	172	68	38	NA
MAU (%)	37.8	41.2	52.6	0.11

NA = not applicable

(Table 7). β-blocker with a CCB (30.6%), ACE inhibitor with diuretic (23.5%), and ACE inhibitor with CCB (12.2%) were frequently prescribed whereas 5 patients received β-blocker with ACE Inhibitor (data not shown). Diuretic, β-blocker combined with either an ACE inhibitor (18.5%) or a CCB (19.6%) were also observed if three drug combinations were chosen (data not shown). As four-drug combinations, a diuretic plus a β-blocker plus a CCB plus an ACE inhibitor were the most commonly prescribed regimen (54.3%)(data not shown).

Regarding the extent of glycemic control, only 289 patients had adequate data on HbA_{1C} levels for analyses. Overall, 172 patients (59.5%) had HbA_{1C} values < 1% above upper normal limit, 77 patients (26.6%) had values 1-2% above upper normal limit, and 40 patients (13.8%) had values > 2% above upper normal limit. Being good glycemic control (FBS 90 - 130 mg/dl plus HbA_{1C} < 7.0%), only 73 (25.3%) type 2 diabetic hypertensives could achieve these targets (data not shown). After excluding 22 cases of macroalbuminuria, the extent of glycemic control was demonstrated in Table 8.

Eighty-three patients (27.7%) were managed with non-pharmacological means for the blood glucose control. Of the 217 patients (72.3%) given hypoglycemic agents, 214 patients (98.6%) were given oral agents (sulfonylurea and/or metformin), while insulin was added in 3 patients (1.4%) (data not shown).

The extent and type of lipemic control were also examined in 294 patients. One hundred and twenty-five patients (42.5%) had achieved normal total cholesterol level (< 200 mg/dl). One hundred and thirty-four patients (46.7%) had normal triglyceride level (< 150 mg/dl). Fifty-seven male (64.0%) had HDL-cholesterol of > 40 mg/dl. Eighty-nine female (50.0%) had HDL-cholesterol of > 50 mg/dl. Sixty-eight patients (25.3%) had serum LDL-cholesterol level of <100 mg/dl. Finally, there were only 24 patients (8.9%) could be classified as eulipemic in all serum lipid parameters (data not shown). One hundred and sixty patients were managed with non-pharmacological means for hyperlipidemia whereas 140 patients were given lipid-lowering agents. Of them, 112 (80%) were treated with statins and 28 (20%) were treated with fibrates.

The prevalence of macroalbuminuria was 7.3% (22/300), 10% in males and 6% in females ($p = 0.78$), while the prevalence of MAU was 40.7% (113/278), 48.9% in males and 36.7% in females ($p = 0.0001$). There was no significant differences between patients with normoal-buminuria and those with MAU by age, sex, BMI, levels of BP, fasting plasma glucose, glycosylated hemoglobin, creatinine, LDL-Cholesterol, HDL-Cholesterol, BP normalization, ACE inhibitors or angiotensin receptor blockers usage. The prevalence of MAU rose with an increase in duration of diabetes of 1 to 5 years (35.5%), > 5 to 10 years (50.0%), and > 10 years (63.2%) as well as an increase in duration of hypertension of 1 to 5 years (36.0%), > 5 to 10 years (42.0%), and > 10 years (51.0%) (Table 9).

DISCUSSION

Epidemiological findings on the prevalence rates of MAU in patients with type 2 diabetes ranging from 8 to 32% among Caucasian[13-14] and 14.1 to 39% among Asian populations.[15-16] The UK Prospective Diabetes Study (UKPDS) reported that 12% of patients have MAU at the

TABLE 9. Number of diabetic hypertensive patient with MAU according to the duration of diabetes and hypertension (excluding 22 cases of macroalbuminuria).

	1 to 5 years	>5 to 10 years	>10 years	p-value
Number of diabetic hypertensive patient with MAU according to the duration of diabetes (%)	197 (35.0)	62 (50.0)	19 (63.2)	0.02*
Number of diabetic hypertensive patient with MAU according to the duration of hypertension (%)	139 (36.0)	88 (42.0)	51 (51.0)	0.17

time diagnosis of diabetes.[17] Our findings showed that the prevalence of MAU among diabetic hypertensives was high (40.7%). Excluding cases with macroalbuminuria, the prevalence of diabetes hypertensives with MAU (37.7%) is comparable to those reported by Bramlage and coworkers among German nationwide studied on diabetic hypertensives,[18] the HYDRA study (37.8%) as well as to those reported by Fagnani and colleagues among a national random French representative sample of diabetic hypertensives (36.0%).[19] The prevalence of MAU in hypertensive diabetic males was higher than females (48.9% vs. 36.7%) which was comparable to the observations from a large (n = 65,258) population-based Nord-Trondelag Health Study (HUNT) carried out in Norway (42.2% vs. 25.9%)[20] and from another population-based cohort of 1,967 type 2 diabetic patients in Italy.[21] Our results also conformed with the study carried out in 583 European and 889 South Asian Type 2 Diabetic clinic attendees in London (33% vs. 19% and 40% vs. 33%, respectively).[22] The frequencies of MAU in patients with poorly controlled diabetes ($HbA_{1C} \geq 7$ mg/dl) was not different from those with well controlled diabetes ($HbA_{1C} < 7$ mg/dl) ($p = 0.11$). This observation is similar to those observed study carried out in South Asians at Ealing Hospital.[22] On the contrary, a cross-sectional survey of 24,317 diabetic patients, the Diabcare-Asia 1998 study, showed a higher prevalence of MAU and microvascular complications in patients with higher HbA_{1C}.[15] The Heart Outcomes Prevention Evaluation Study showed an increase of microvascular complication by 8% for every 0.9% increase in glycated hemoglobin (a glycated hemoglobin assay with an upper limit of 6% in the non-diabetic range).[23] This can be from a limited number of participants enrolled in our study to elicit any statistical significance and our study population were all hypertensive patients. Lastly, our results were similar to many other studies which showed that the long duration of diabetes was significantly associated with an increase in the prevalence of MAU.[23-26] Nevertheless, there was no significant association between the duration of hypertension and the prevalence of MAU.

Although, BP goal of antihypertensive therapy in diabetic hypertensive patients was unanimous clearly defined in many guidelines, BP control rates remain sub-optimal. Similarly, BP normalization rate (< 130/80 mm Hg) in this study could be achieved only in 15.3% (Table 4), which corresponded to that (18.4%) reported by Fagnani and colleagues (using BP < 140/80 mm Hg)[19] and that (19.0%) reported by Steckelings and colleagues (using BP < 140/90 mm Hg).[27] Reluctant to treat was unlikely since nearly all were treated with antihypertensive drugs, compared to that reported in the Inter-ASIA study (98.3% vs. 66.5%).[9] Moreover, nearly half were given three or more drugs. In our study, 295 (98.3%) diabetes hypertensives were given one or more antihypertensive drugs, 243 (81.0%) were treated with combination therapy (two or more antihypertensive drugs) and monotherapy were infrequent prescribed (17.3%). Therefore, infrequent use of combination therapy as a cause of uncontrolled BP should not be the problem in this study. A paradoxical finding in the extent of BP controlled rates and a number of the combination drug used had been observed. The failure of physicians to step up treatment to achieve the recommended target BP, partly because of the concern that uptitration of medication may lead to adverse events and reduced compliance or inappropriate drug combinations.[28-30] However, there were only 5 patients in this study who received β-blocker and ACE Inhibitor combination.

More than half of all type 2 diabetes hypertensives in our study (59.5%) could achieve a satisfactory blood sugar control ($HbA_{1C} < 7\%$). Regardless of BP status among diabetes subjects, our control rate seemed to be higher than those reports from many Asian countries. The general HbA_{1C} reported from the overall 18,211 diabetes patients studied among various Asian countries/regions ranged from 16% to 34%.[15] However, Lee and colleagues performed a national survey at primary health cares level in Singapore, a more urbanized setting, around 50% had a satisfactory blood sugar control.[31] Handling cases by specialists, referral-care settings, following evidence based medicine and guidelines might possibly affect on the control rates.

The LDL-cholesterol goal achievement as a primary objective in lipid lowering treatment for our diabetic patients was also not satisfactory. It could be achieved only in a quarter of cases (Table 1). Nevertheless, this conformed with the reports elsewhere. Pyorala and colleagues had studied on the risk factor management among 1,086 diabetic patients in the 15 European countries during 1999 to 2000, the EUROASPIRE II survey. They found a similar control rate (24.6%).[32] Moreover, our result was better than that of the 4,844 American diabetic patients without coronary heart disease in electronic medical record database observed by Fuke and associates (18%).[33]

Inadequate glycemic, lipemic, especially BP controls among Thai hypertensive individuals with type 2 diabetes with inevitably create a lot of organ damage. Uncontrolled diabetes and its risk factors are associated with premature death and disability as well as decreased quality of life and significantly add to national medical health care expenditures. Therefore, adequate controls regularly checked by audition remain the major therapeutic objectives for prevention of target organ damage and other complications arising from diabetes.

SUMMARY

Among 300 type 2 diabetic hypertensive patients studied, 7.3% found to have macroalbuminuria and 37.7% MAU. Less than 15% had a BP below the recommended target (130/80 mm Hg). There were 59.5% of euglycemic control ($HbA_{1C} < 1\%$ above upper normal limit) and 8.9% of eulipemic control (LDL-C < 100 mg/dl + triglyceride < 150 mg/dl + HDL-C > 40 mg/dl in male and > 50 mg/dl in female). Therefore, MAU had to be tested in all diabetic patients at the time of diagnosis for a proper management. More aggressive control, glycemic, dyslipemic control, should be attempted to protect organ damage especially cardiovascular complications and diabetic nephropathy.

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บทคัดย่อ

ไมโครแอลบูมินในปัสสาวะผู้ป่วยเบาหวานชนิดที่สองร่วมกับเป็นโรคความดันโลหิตสูง

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ผู้วิจัยได้ศึกษาความชุกของไมโครแอลบูมินในปัสสาวะผู้ป่วยเบาหวานชนิดที่สองร่วมกับเป็นโรคความดันโลหิตสูงที่มารับการตรวจที่แผนกผู้ป่วยนอกระหว่างเดือนตุลาคม 2545 ถึงเดือนพฤศจิกายน 2546 ผู้ป่วยที่จะเข้าโครงการจะต้องไม่เคยได้รับการตรวจปัสสาวะมาก่อนหรือเคยตรวจพบว่าไม่มีแอลบูมินในปัสสาวะมาก่อน ข้อมูลทางประชากรศาสตร์และทางคลินิกจะได้รับการรวบรวมโดยผ่านทางแบบสอบถาม ใช้ Nephur® test ในการตรวจปัสสาวะหาแมคโครแอลบูมินในผู้ป่วยทุกราย และใช้ Micral® tests ตรวจต่อในรายที่ตรวจไม่พบแมคโครแอลบูมินในปัสสาวะ ผู้ป่วยชาย 100 ราย (อายุเฉลี่ย 59.3 ± 11.0 ปี) และผู้ป่วยหญิง 200 ราย (อายุเฉลี่ย 60.3 ± 10.1 ปี) ได้รับการคัดเลือกเข้าในการศึกษา โดยมีดัชนีมวลกายเฉลี่ย 27.3 ± 4.3 กก./ม^2 (ชาย 26.9 ± 4.1 กก./ม^2 และหญิง 27.6 ± 4.4 กก./ม^2) พบว่าอุบัติการณ์ของแมคโครแอลบูมินในปัสสาวะเท่ากับร้อยละ 7.3 (22 ใน 300 ราย), เป็นชายร้อยละ 10 และเป็นหญิงร้อยละ 6 (p = 0.78) ขณะที่ตรวจพบความชุกของไมโครแอลบูมินในปัสสาวะเท่ากับร้อยละ 40.7 (113 ใน 278 ราย), เป็นชายร้อยละ 48.9 และเป็นหญิงร้อยละ 36.7 (p = 0.0001) ในเรื่องของอายุ, เพศ, ดัชนีมวลกาย, ระดับความดันโลหิต, ระดับน้ำตาลจากการงดอาหาร, ไกลโคซิเลตเต็ด ฮีโมโกลบิน, ครีอะตินิน, แอลดีแอล-โคเลสเตอรอล, เฮ็ชดีแอล-โคเลสเตอรอล ในพลาสมาไม่พบความแตกต่างอย่างมีนัยสำคัญระหว่างผู้ป่วยซึ่งตรวจไม่พบแอลบูมินในปัสสาวะและผู้ป่วยที่ตรวจพบไมโครแอลบูมินในปัสสาวะ รวมทั้งอัตราการควบคุมระดับความดันโลหิตให้ปรกติตามข้อแนะนำของ ADA 2003 และการใช้ยากลุ่ม ACE inhibitor หรือ Angiotensin receptor blocker ความชุกของการตรวจพบไมโครแอลบูมินในปัสสาวะเพิ่มขึ้นตามระยะเวลาที่เป็นโรคเบาหวาน 1 ถึง 5 ปี (ร้อยละ 35.5), มากกว่า 5 ถึง 10 ปี (ร้อยละ 50.0) และมากกว่า 10 ปี (ร้อยละ 63.2 และระยะเวลาที่เป็นโรคความดันโลหิตสูงเช่น 1 ถึง 5 ปี (ร้อยละ 36.0), มากกว่า 5 ถึง 10 ปี (ร้อยละ 42.0) และมากกว่า 10 ปี (ร้อยละ 51.0) จำนวนยาลดความดันโลหิตที่รับประทานเฉลี่ย 2.5 ± 1.1 ชนิดเพื่อจะควบคุมให้ระดับความดันโลหิตเฉลี่ยอยู่ที่ 137.5 ± 12.3/ 80.6 ± 7.8 มม.ปรอท