RELATIONSHIP OF MICROALBUMINURIA WITH DIFFERENT CLINICAL AND BIOCHEMICAL PARAMETERS IN NEWLY DETECTED DIABETES MELLITUS CASES

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Summary

This study was conducted to assess the presence of microalbuminuria in newly detected diabetes mellitus (DM) cases in a small group of Bangladeshi population attending BIRDEM out patient department and to find out the relationship (if any) of microalbuminuria with different clinical and biochemical parameters. Out of 110 DM cases, 10 (9.1%) were found to have microalbuminuria. Blood pressure, both systolic (r=0.190) and diastolic (r = 0.30) had significant positive correlation with urinary albumin. There was no association of microalbuminuria with waist circumference, waist to hip ratio, serum triglycerides, HDL cholesterol, fasting blood glucose, age, sex, weight, height or BMI. This suggests that all newly detected diabetes mellitus should be screened for raised blood pressure and if found positive be given the same importance as blood glucose. They should be treated meticulously to revert or prevent microalbuminuria and thus prevent complications.

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Introduction

It is not uncommon to find evidence of microvascular complications of diabetes in newly detected diabetes mellitus cases.[1] Microalbuminuria includes a range of urinary excretion of albumin of 20 to 200 microgram/minute or 30 to 300 mg/24 hrs.[2] Albumin ratio of 30-300 mg/gm creatinine in the first voided sample in morning (clean, midstream) is also considered as mircoalbuminuria.[2] There is considerable evidence that microalbuminuria is a strong predictor of cardiovascular mortality.[3,4] Some studies suggested that abdominal obesity is independently associated with microalbuminuria.[5-10] Whereas others showed that abdominal obesity is not related to albuminuria level.[11,12] The multivariate analysis done by Chen *et al*.[13] showed that the risk for being affected by chronic kidney disease was more than twice as high in patients with an increased waist circumference than those without, suggesting that obesity may be an independent risk factor for chronic kidney disease. Metabolic syndrome is a common risk factor for cardiovascular mortality, morbidity, microalbuminuria and chronic kidney disease.[14,15] Hypertension has long been associated with microalbuminuria.[16,17-19] Clinically microalbuminuria may be an indicator of early vascular complication of hypertension.[20] In the above context, more studies are needed to find out the relationship of microalbuminuria with different clinical and biochemical parameters in newly detected diabetes mellitus cases in a population with lower cut-points for waist circumference and different racial origin from western world. In this context, the present study was designed in a small group of Bangladeshi population.

Materials and Methods

This cross sectional study was conducted between January 2006 to May 2007 in the Department of

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Endocrinology, Bangladesh Institute of Research and Rehabilitation for Diabetes, Endocrine and Metabolic Disorders (BIRDEM), Dhaka, Bangladesh. The subjects were selected purposively. The calculated sample size was 162. A total of 185 newly detected diabetic cases were selected which was 15% more than the calculated sample size. 75 cases could not be included in the final analysis, as 73 cases had UTI or gross proteinuria and in 2 cases ACR was more than 300 mg/g. As such, 110 cases were valid for analysis.

Subjects were selected everyday excepting Friday from 11.00 am to 12.00 noon from the OPD of BIRDEM who came for checking their glycaemic status. After taking a brief history, preliminary selection was done and the purpose of the study was explained in details to each subject. They were requested to report to the Department of Endocrinology BIRDEM next morning following an overnight (8-14 hours) fast. When the subjects reported, informed written consent was obtained. Newly detected cases of diabetes mellitus (fasting plasma glucose ≥7.0 mmol/L or 2 hrs after 75 g glucose ≥11.1 mmol/L) were included in the study. Patients having fever, urinary tract infection, congestive heart failure, pregnancy, menstruation, serum creatinine >1.5 gm/dl, urinary albumin to creatinine ratio >300 mg/g, diabetic retinopathy on ophthalmoscopy, age below 20 or above 70 years were excluded from the study. The protocol was cleared by the ethical review committee of Diabetic Association of Bangladesh. Fasting blood was collected between 8.00-9.00 am. Venous blood (6 ml) was taken by venepuncture with the subject sitting comfortably in a chair in a quiet room. After 10-15 minutes blood samples were centrifuged for 10 minutes at 3000 rpm to obtain plasma. First morning sample of urine was collected in two different tubes, one for estimating albumin creatinine ratio and another for detection of overt protienuria, pus cell and RBC. Statistical analysis was performed using SPSS software for windows version 11.5. All data were expressed as mean with 95% confidence interval and percentage (%) as appropriate. The statistical significance of differences between the values were assessed by independent sample 't' test or χ^2 test (as appropriate). Pearson bivariate correlation was seen among the parameters. A p value of <0.05 was considered statistically significant.

Table-1: *Clinical and biochemical characteristics of total study subjects (n=110)*

Variable	Mean/ Frequency	SD
Age	44.2	9.1
Weight	63.8	9.7
Height	158.5	9.2
BMI	25.5	3.8
Waist	90.5	7.9
Hip	95.7	7.7
WH Ratio	0.9	0.1
Systolic BP	122.3	17.5
Diastolic BP	78.0	10.6
Fasting Blood Glucose	185.6	53.3
2hrs after 75g Glucose	299.4	69.4
HDL	38.1	1.8
TG	204.8	132.7
ACR	25.8	28.9
S. Creatinine	0.9	0.2
Metabolic Syndrome		
Present	93 (88.2%)	
Absent	13 (11.8%)	
Microalbuminuria		
Present	10 (9.1%)	
Absent	100 (90.9%)	

Results

One hundred ten newly detected diabetes mellitus cases were studied.

Height, blood pressure (systolic and diastolic), fasting blood glucose, serum triglyceride, serum creatinine were higher and age, weight, BMI, waist circumference, waist hip ratio, blood glucose 2hrs after 75g oral glucose load and serum HDL, were lower in the microalbuminuric group than among the normal group. But the differences were not significant.

Only diastolic blood pressure was significantly higher in the microalbuminuric patients ($p< 0.005$).

Pearson bivariate correlation was done among the variables which showed that there was a positive correlation of urinary albumin to creatinine ratio (ACR) with systolic blood pressure ($r = 0.190$, $p < 0.05$) and diastolic blood pressure ($r = 0.300$, $p = 0.001$).

Table-2: *Clinical and biochemical characteristics of microalbuminuric and normoalbuminuric patients (n=110)*

Variables	Microalbuminuric		p value
	Present (N=10)	Absent (N=100)	
Age	42.7 (37.51 - 47.89)	44.31 (44.48 - 46.14)	0.22
Sex (M:F)	2:1	1.4:1	0.375
Weight	61.90 (55.17 - 68.63)	64.00 (62.06 - 65.94)	0.75
Height	161.35 (155.30 - 167.39)	158.21 (156.37-160.04)	0.72
BMI	23.77 (21.63 - 25.92)	25.62 (24.87 - 26.39)	0.35
Waist	88.8 (84.91 - 92.69)	90.70 (89.09 - -92.32)	0.16
Hip	94.7 (91.57 - 97)	95.81 (94.22 - 97.40)	0.09
WHR	0.94 (0.91 - 0.97)	0.95 (0.94 - 0.97)	0.30
DM in 1st degree Relatives	2:3	1:1	0.418
Systolic BP	130 (114.14 - 145.82)	121.5 (118.17 - 124.88)	0.14
Diastolic BP	85.8 (74.96 - 96.64)	77.23 (75.28 - 79.18)	0.005
Fasting blood Glucose	187.18 (147.34-227.02)	185.48 (174.89 - 196.08)	0.95
Blood glucose 2hrs after 75g glucose	291.96 (242.51-341.41)	300.17 (286.34 - 313.99)	0.63
HDL	37.9 (36.27 - 39.53)	38.19 (37.19 - 38.55)	0.61
TG	230.7 (135.63-325.77)	202.19 (175.80 - 228.58)	0.82
MS (Yes:No)	4:1	8:1	0.336
S.creatinine	0.93 (0.81 - 1.05)	0.89 (0.86 - 0.93)	0.84
AntiHTN (Yes:No)	0:10	1:10	0.32

Discussion

In this study efforts were made to detect risk factors in the development of microalbuminuria in newly detected diabetes mellitus cases.

It was seen that blood pressure, both systolic and diastolic was higher in microalbuminuric patients than normoalbuminuric patients. The differences were significant only in case of diastolic blood pressure but not with systolic blood pressure. Significant positive correlation was also seen between diastolic blood pressure and albumin in urine (r=0.300, p =0.001).

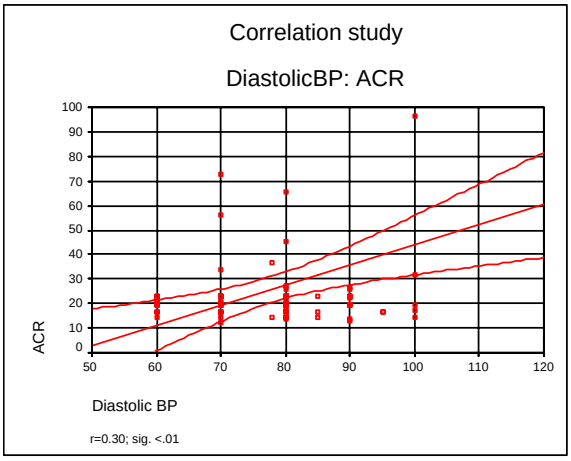

Fig-1: *Correlation between diastolic blood pressure and ACR*

A cross sectional study conducted in USA also found strong association of microalbuminuria with high blood pressure.[20] Other studies conducted in different countries have also found an association of microalbuminuria with hypertension.[16,17-19] Increases in intraglomerular capillary pressure are thought to cause leakage of albumin.[21] Clinically microalbuminuria may be an indicator of early vascular complication of hypertension.[20] Signs of early endothelial dysfunction as manifested by microalbuminuria may herald impending renal impairment and may offer another focus for treatment.[20]

This study indicates that there is no association between either fasting or post glucose load blood glucose with microalbuminuria (p > 0.95 & 0.63 respectively). A recent study of Korean general population[22] showed that subjects with microalbuminuria had higher fasting plasma glucose than subjects without microalbuminuria. The reason for this dissimilarity may be due to the fact that our

series is comprised of newly detected diabetics only, thus reflecting microalbuminuria in chronic elevated blood glucose levels.[20] A study conducted in India showed that prevalence of microalbuminuria at diagnosis of type 2 diabetes was 12.2%.[1] This study was almost similar with 9.1% of the patients having microalbuminuria.

Waist circumference was not associated with microalbuminuria (p=0.16). In a study conducted in USA, large waist was not associated with microalbuminuria[20] but other studies conducted in Europe[23] and other places[11,12] showed a significant association. The small sample size genetic factors and different cut-off points for abnormal value of waist circumference in this study may be the cause of the different findings and further studies with larger sample size is necessary to substantiate the findings. No relationship was found between serum triglyceride or serum HDL with microalbuminuria. Other studies also showed similar results.[20,22]

Metabolic syndrome as a whole was not significantly higher in microalbuminuric patients. One large study conducted in USA found a strong positive association between these two parameters.[20] A study conducted amongst the Caucasian general population[24] suggested that microalbuminuria is a complication of hypertension and type 2 diabetes but was not an integral part of the metabolic syndrome. Further prospective studies are needed to confirm these findings.

No association was found between the hip-circumference and microalbuminuria or waist hip ratio with microalbuminuria. One study in the Korean population[22] found association of microalbuminuria with waist hip ratio. Ethnic differences may be an explanatory factor for these differences. In this study no association was seen between microalbuminuria and BMI. BMI was associated with microalbuminuria in previous studies[25,26] but not in recent ones.[27] No significant association was found in respect to age, sex, weight, height with microalbuminuria. Use of antihypertensive drugs did not show any type of correlation with microalbuminuria. This finding may be due to inadequate treatment of hypertension.

Conclusion

This study documents that the patients having higher blood pressure at diagnosis of diabetes mellitus are associated with higher chances of microalbuminuria. So hypertension should be treated as an independent risk factor in developing microalbuminuria in early diabetes mellitus cases. This necessitates that all newly detected diabetes mellitus should be screened for blood pressure with the same importance as given for blood glucose and any raise should be treated meticulously to revert or prevent microalbuminuria and thus prevent the complications. Absence of relationship of elevated blood glucose and microalbuminuria may be due to newly detected diabetics in this study which needs further follow up before making conclusive recommendations.

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