Metabolic Syndrome in Chronic Kidney Disease Patients

*Nath RK,[1] Mridha MU,[1] Sarker KR,[2] Mollah FH,[3] SFerdousi S,[4] Rahman M[5]

Due to sedentary life style and performing daily routine works depending on modern equipments and habiting fast food, metabolic syndrome (MS) is going to become a global health challenge. MS is a multiplex risk factor that consists of dyslipidemia, hypertension, hyperglycemia, and obesity. Persons with the metabolic syndrome are at essentially twice the risk for cardiovascular disease compared with those without the syndrome. We determine the component of the metabolic syndrome in chronic kidney disease (CKD) patient admitted in referral hospital in Dhaka city and find out the prevalence of the each component of MS as well as the prevalence of the metabolic syndrome in CKD patients to assess their metabolic status. This study also compared age and sex in between MS and non MS subject. In this study, 300 (161 males and 139 females) patients older than 15 years diagnosed CKD were sampled purposively. Metabolic syndrome was diagnosed using Adult Treatment Panel-III (ATP-III). The study found that 44% patient had hypertriglyridemia, 71% had low HDL, 76% were hypertensive, 47% had hyperglycemia, and only 13% were obese. Metabolic syndrome was present in 111 (37%) subjects (CI 31–42%), prevalence was 32.3% in men and 42.5% in women. MS was related positively with age ($p < 0.001$) but gender ($p > 0.05$) had no impact on MS. Prevalence of MS was found most in patient admitted in referral hospital in Dhaka and hypertension was most prevalent component of MS.

[Dinajpur Med Col J 2012 Jan; 5 (1):34-38]

Key words: Metabolic syndrome, chronic kidney disease

Introduction

Metabolic syndrome (MS) is characterized by abdominal obesity, hyperglycemia, hypertension, hypertriglyceridemia and reduced high density lipoprotein (HDL) cholesterol.[1] According to the National Cholesterol Education Program, Adult Treatment Panel III (NCEP-ATP III) metabolic syndrome is defined as the presence of three or more of the following criteria.[2] Elevated blood pressure (≥130/85 mm of Hg), elevated fasting plasma glucose level (≥110 mg/dl or ≥6.1 mmol/l), high serum triglyceride level (≥150 mg/dl), low serum HDL cholesterol level (<40 mg/dl in men and <50 mg/dl in women), waist circumference is >102 cm in men and >88 cm in women.

The prevalence of MS has been increasing at an alarming rate through out the world. The current prevalence of MS in United States, Europe and in China is estimated to be 27%, 15.7% and13.7% respectively and female had a bit higher prevalence than male.[3] MS is common in developed country and its prevalence is expected to become even higher in near future together with rapidly increasing the prevalence of obesity. The prevalence of MS among general population in this subcontinent is relatively lower than western world. This may be due to different life style, dietary habit and mood of work. In India prevalence of MS is 12.4% in adult but in adolescent it is 5.8%.[4]

1. *Dr. Ronjon Kumer Nath , Department of Biochemistry, Kumudini Women,s Medical College.
2. Dr. Md Zashim Uddin Mridha , Department of Biochemistry, Dinajpur Medical College.
3. Dr. Forhadul Hoque Mollah Department of Biochemistry, BSMMU.
4. Dr. Shaheen Ferdousi, Department of Biochemistry, East-west Medical College.
5. Dr. Mahbubur Rahman Department of Biochemistry, Pabna Medical College.

**For correspondence*

MS is highly prevalent in chronic kidney disease (CKD) patient with dialysis. In United States overall prevalence of MS in incident dialysis patient is 69.3% (78% among female and 63% among male). In Australia the current prevalence of MS in severe CKD patient is estimated to 30.5%.[5, 6] CKD is defined as either kidney damage or decreased kidney function (decreased GFR) for 3 or more months. CKD is defined according to the following criteria: kidney damage for ≥3 months as defined by structural and functional abnormalities of kidney with or without decreased GFR, manifest by either pathological abnormalities or markers of kidney damage, including abnormalities in the composition of the blood or urine or abnormalities in imaging tests or GFR <60 ml/min/1.73 m^2 for ≥3 months, with or without kidney damage.[7] The consequence of the increasing epidemiology of CKD are devastating, not only for the patients themselves but also in term of the economic demands on the society. CKD often is characterized by progression into ESRD a condition that needs renal replacement treatment (RRT).[8]

Diabetes is a major risk factor for the initiation and progression of CKD and individuals with evidence of the MS have a substantial risk for developing type 2 diabetes over time. Epidemiologic studies have linked the MS with an increase risk for microalbuminuria, an early marker of kidney damage.[9] The recent studies found strong association between MS and CKD. CKD is the negative consequence of MS.[10, 11] However, the prevalence, predictors, prognostic value and treatment of MS in CKD population have not been vigorously studied. Therefore we designed this research to observe the presence of individual component of MS as well as prevalence of CKD in MS patients and thus illuminating area regarding relationship between MS and CKD.

Methods

This cross sectional study was conducted in the Biochemistry Department of Bangabondhu Sheikh Mujib Medical University (BSMMU) over a period of one year extending from July 2006 to June 2007. A total of 300 CKD patient diagnosed by specialist at Nephrology Department of Dhaka Medical College Hospital, BSMMU and National Institute of kidney Disease and Urology by history, clinical examination, and laboratory investigation. Blood pressure was measured by sphygmomanometer by following standard procedure and Waist circumference was measured one centimeter above naval at minimal respiration of all study sample. Fasting blood sugar, serum HDL-cholesterol, serum TG were also measured on enzymatic colorimetric method. Unpaired t-test and chi-square test ware done to see the level of significance and 95% confidence limit ($p<0.05$) was taken as level of significance.

Results

Among 300 study subjects 161 were male rest 139 were female, 133 cases having high TG, 214 subjects were containing low HDL, 143 subjects were hyperglycemic, 228 were hypertensive and 39 cases were obese. Out of 300 cases 111 subjects posses three or more component of MS and were diagnosed as MS subjects and rest 189 subjects were considered as normal. Among the male cases 52 subjects were MS and 109 ware not, in female cases 59 were MS subjects and 80 were normal. Among the subject with MS mean age was 50.5 years and non-MS subject was 44.4 years. The prevalence of MS in male, female and total study subjects were 32.3% (CI =25-39%), 42.5% (CI=34-50%), and 37% (CI=31-42%) respectively (table I).

Table I: Distribution and prevalence of MS in male, female & all study subjects with confidence interval

Sex	*MS*	*Non-MS*	*total*	*Prevalence (%)*	*Confidence interval(CI)*
Male	52	109	161	32.30	25-39
Female	59	80	139	42.45	34-50
Total	111	189	300	37	31-42

the prevalence of individual component of MS in CKD patients were 44.33% for high TG, 71.3% for low HDL, 47.7% for hyperglycemic 76% for hypertensive and 13% for obesity (detected by measuring waist circumference). Within the components prevalence of hypertension was high in CKD patients. (Table II).

Table: II Prevalence of individual component of MS in CKD patients

Component of MS	Normal (Cases)	High (Cases)	Total (Cases)	Prevalence (%)	Cut off value
TG	167	133	300	44.3%	≥150mg/dl
FBG*	157	143	300	47.7%	≥ 6.1mmol/L
BP	72	228	300	76%	≥130/85mm of Hg
WC**	261	39	300	13%	≥102 Cm in man & > 88cm in Women
HDL	86	Low-214	300	71.3%	< 40mg/dl in men & <50 mg/dl Women

**Fasting blood glucose ** Waist circumference*

Comparison of age and sex between MS and non-MS group was done and statistically significant difference was found in age ($p< 0.001$) but not in male- female ($p>0.05$), (table III & IV).

Table: III Comparison of age in MS and non MS subjects of CKD patients

Group	Mean ± SD (years)	p
MS	50.5±11.9	< 0.001
Non-MS	44.4±13.4	

Table: IV Comparison of sex in MS and non MS subjects of CKD patients

Group	Male	Female	P value
MS	52	59	> 0.05
Non-MS	109	80	

Discussion

In this cross sectional study the concentration of fasting blood sugar, TG, HDL-cholesterol, blood pressure and waist circumference were measured to evaluate the metabolic syndrome to find out of prevalence.

The overall prevalence rate of MS in our study was 37% which was higher than the same study done in Australia (31%), but lower than that of United States (69%) which was done in CKD patients with dialysis.[5,6] The prevalence rate of MS in our study was near about similar to that of Chinese population aged 40 years and older (34.1%).[11] Our prevalence rate was also higher than that of Australian general population (20%) and from adolescents of a north Indian population (36%).[12,5] This may be due to different types of subjects selection. The results of our study also lower than in CKD patients with renal transplant recipients (55%) in USA.[13] This finding suggested that the prevalence rate of MS in CKD patients of tertiary level in Dhaka city is slightly higher than India but much lower than developed world like Australia and United States.

The prevalence rate of MS in male and female were 32.3% and 42.5% respectively. Although the prevalence rate was higher in female than male but there was no statistically significance difference in male & female. Our finding was not consistent with other published report.[14] The reason behind this discrepancy might be the diagnostic criteria used for subject's selection and small sample size. But a few published data support our findings.[4]

It is also of interested to note that the prevalence rate of MS was significantly high in older age group than younger which was similar with other studies.[5,6] This finding indicates that age may be a pathophysiological factor for MS. Some study also observed that advancing age affects all level of pathogenesis of MS.[15] We also observed that the prevalence of individual component in CKD patients is high and HTN is more which is competent with some other study done in USA but dissimilar with some study done in china where low HDL is more prevalent.[9,12]

Conclusion

We have done this study with limited time and study sample but found an important message that the component of MS is going to be raised with alarming sign and going to be threatening our life. This study also revealed the prevalence of MS in CKD patients admitted in referral hospital in Dhaka city was not negligible. The higher prevalence was found in older age. More studies are needed to identify the risk of MS as well as CKD and find out actual pictures of MS in CKD patients in Bangladesh. The higher prevalence can be reduced by proper monitoring and management of CKD patients.

References

1. Schelling JR & Sedor JR. The metabolic syndrome as a risk factors for chronic kidney disease: More than a fat chance? J AM Soc Nephrol 2004; 15:2773-2774.
2. Locatelli F, Pozzoni P & Vecchio LD. Renal manifestations in the metabolic syndrome. J Am Soc Nephrol 2006;17:81-85.
3. Cirillo P, Sato W, Reungjui S et al. Uric acid, the metabolic syndrome, and renal disease. J Am Soc Nephrol 2006;17:165-168.
4. Singh R, Bhansali A, Siali R et al. Prevalence of metabolic syndrome in adolescents from a north Indian population. Diabet Med 2007;24:195-199.
5. Barclay L. Metabolic syndrome highly prevalent in dialysis patient. Hemodial Int 2007;11:86-95.
6. Johnson DW, Armstrong K, Campbell SB et al. Metabolic syndrome in severe chronic kidney disease : Prevalence , predictor, prognostic significance and effects of risk factor modification. Nephrology 2007;12:391-398.
7. K/DOQI clinical practice guidelines for chronic kidney disease, Evaluation, classification, and stratification of Kidney disease Outcomes Quality Initiative, Am J Kidney Dis, 2002; 39:240-246.
8. Xue JL, Ma JZ, Louis TA et al. Forecast of the number of patient with end-stage renal disease in United states to the year 2010. J Am Soc Nephrol 2001;12:2753-2758.
9. Kurella M, LO JC and Chertow GM. Metabolic syndrome and risk of chronic kidney disease among non-diabetic adults. J Am Soc Nephrol 2005;16:2134-2140.
10. Chen J, Muntner P, Hamm LL et al. The metabolic syndrome and chronic kidney

disease in US adults. Ann Intern Med 2004; 140:167-174.
11. Zhang L, Zuo L, Wang F et al. Metabolic syndrome and chronic kidney disease in a Chinese population aged 40 years and older. Mayo Clin Proc 2007;82: 822-827.
12. Reynolds K & He J. Epidimiology of Metabolic Syndrome. Am. J. Med 2005; 330:273-279.
13. Armstrong KA, Hiremagalur B, Haluska BA et al. Free fatty acids are associated with Obesity Insulin resistance and atherosclerosis in Renal transplant Recipients. Transplantation 2005; 80:937-944.
14. He Y, Jiang B, Wang J et al. Prevalence of the Metabolic Syndrome and its Relation to Cardiovascular Disease in an Elderly Chinese Population. J Am Coll Cardiol 2006; 47: 1588-1594.
15. Grundy SM, Cleeman JI, Daniels SR et al. American Heart Association; National Heart, Lung, and Blood Institute. Diagnosis and management of the metabolic syndrome: an American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement. Circulation. 2005; 112: 2735-2752.