Frequency of Ischaemic Heart Disease Within Metabolic Syndrome.

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Abstract:

Background: The common clustering of glucose intolerance, abdominal adiposity, high triglyceride level, low high-density lipoprotein cholesterol level and high blood pressure in a single individual is referred to as Metabolic Syndrome (MS) and it is associated with ischaemic heart disease (IHD). **Objectives:** To find out the relationship between MS and IHD Design: Cross sectional observational study. **Materials :** 100 subjects were selected following simple random sampling technique. 50 patients of MS and another 50 non MS were enrolled as case and controlled respectively in the department of medicine and cardiology at Sylhet M. A. G. Osmani medical college hospital. **Results:** Proportion of IHD was found to be high among the MS (40%) compared to non MS (16%) and the difference was statistically significant ($p=0.008$) indicating there is a relationship between MS and IHD. Among the components of MS proportion of hypertension (39.2%), diabetes mellitus (41.9%), dyslipidemia (42.6%) and family history of cardiovascular disease (47.1%) had significant higher association with patients with IHD ($p<0.05$). **Conclusion:** The MS has a significant association with IHD by electrocardiogram criteria.

Keywords: Ischemic heart disease (IHD); Metabolic syndrome (MS).

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Introduction:

The MS is defined according to NCEP-ATPIII criteria if a person has three or more of the following criteria: 1) Abdominal obesity: waist circumference (WC) >102 cm in men and >88 cm in women, 2) Hypertriglyceridemia: >150 mg/dl (1.695 mmol/l), 3) Low high-density lipoprotein cholesterol (HDL) level: <40 mg/dl (1.036 mmol/l) in men and <50 mg/dl (1.295 mmol/l) in women,4) High blood pressure (BP): >130/85 mmHg, 5) High fasting glucose: >110 mg/dl (>6.1 mmol/l)[1].

The MS is expected to be diagnosed in millions of subjects in the near future worldwide by either WHO or NCEP-ATPIII criteria. The prevalence of MS has been reported to be 24% in the US adult population[1].

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IHD, cardiovascular disease (CVD) and total mortality are significantly higher in US adults with MS than in those without MS[2]. There is a evidence that the MS plays a pivotal role in the development of CVD by providing a multitude of risk factors which tend to multiply the effect of each other on the vascular system. This effect is particularly pronounced in persons of south Asian origin[3]. The risk of death from all causes and CVD increased with increased numbers of metabolic abnormalities in both man and woman 4,5. The risk of IHD increased three fold with the MS and cardiovascular mortality markedly increased with MS[5].

The prevalence of MS in the adult population in Bangladesh is 9.4%[6] and in other developed countries is 22- 39% and varies depending on the definition used and on ethnicity[7]. MS is also common in Asian Indians and was present in 41.1% in urban Asian Indian adults using modified ATP III criteria[8]. There is high prevalence of MS in

urban Asian Indian in the age group ⊠ 40 years[9]. A few prospective analysis have applied definitions from the NCEP-ATP III or the WHO and reported that the MS is associated with an approximate twofold increase in CVD4. Resting electrocardiogram (ECG) abnormalities suggestive of IHD, angina, myocardial Infarction (MI) have been shown to predict an increased risk of future coronary heart disease (CHD) events in prospective population studies and in clinical trials and are utilized to define subclinical IHD[10].South Asian populations show lower muscle mass and there is selective increase in central obesity[11]. As a result, at a BMI of 24 Kg/m2, 75% of individuals from such ethnic groups display insulin resistance12. This explains their increased risk of diabetes mellitus (DM) and IHD[11,12].

The main objective of this study is to find out the relationship of MS and its major components with IHD using resting ECG criteria. If we can detect the features of MS in an early stage then we can take measures to prevent or postpone DM, IHD and other complication.

Methods:

A Cross-sectional observational study was carried out in patients attending in the department of medicine and cardiology at Sylhet M. A. G. Osmani medical college hospital, Sylhet during the period from July 2007 to June 2008. A total of 100 participants were selected following simple random sampling technique. Everyday first admitted case who fulfilled the inclusion criteria for MS was enrolled as case. After every case subsequent admitted patient who has no features of MS was enrolled as controlled. In this way 50 patients of MS were enrolled as case and another age and sex matched 50 were enrolled as controlled. Subjects were informed about the nature and purpose of the study and informed written consent were taken from them. Information regarding personal history and physical findings and risk factors for IHD, treatment history were collected, relevant physical examinations like height, weight, WC, hip Circumference, waist-hip ratio (WHR), BP was recorded..The MS was diagnosed with the criteria indicated by the NCEP-ATP III. The diagnosis of IHD was based on Clinical history and resting ECG finding (According to Minnesota coding criteria) and H/O previous MI.

Case was seclected: Case: a) According to NCEP -ATP III -1) Abdominal obesity: WC >102 cm in men and >88cm in women, 2) Hypertrigly-ceridemia: >150 mg/dl (1.695 mmol/l), 3) Low HDL cholesterol: <40 mg/dl (1.036 mmol/l) in men and <50 mg/dl (1.295 mmol/l) in women, 4) High BP: >130/85 mmHg, 5) High fasting blood glucose: >110 mg/dl (>6.1 mmol/l). b) Both male and female. c) Age 30 years and over.

For extra : Control: a) healthy subjects without MS, Both male and female, Age matched (5 yrs) with case were included.

a) Acutely ill patients. b) Age less than 30 years. c) Abdominal distention due to any cause (eg. Ascitis, pregnancy) were encluted.

A fasting blood sample was taken for estimation of fasting lipid profile, fasting plasma glucose (FPG) and ECG were done.

Data was analyzed with the help of Statistical Package for the Social Science (SPSS) software package windows version 12. Statistical method used in data analysis: a) Unpaired student's t-test, b) X2 – test, c) Correlation coefficient test.

A 'p' value of <0.05 was considered statistically significant. The data was presented in frequencies, percentages, and 95% confidence intervals (CI). Ethical clearance was taken from ethical committee of Syhet MAG Osmani Medical College. Sylhet.

Results :

The proportion of HTN, DM, dyslipidemia and family history of CVD was higher among the cases than the control (p= 0.001) (Table-I). The mean composite risk factors was found to be high among the cases ⊠3.7⊠0.9⊠ than the control (0.7⊠0.6) (p=0.001).Serum mean fasting glucose, TG, total cholesterol (TC) were significantly higher among the cases than the control (p<0.05), but no statistically significant mean differences were found between case and control in terms of LDL and HDL ⊠ p>0.05) (Table-II). IHD was found to be high among the MS (40) compared to control (16) (p=0.008) indicating there is a relationship between MS and IHD (Table-III). The mean composite risk factors was 3.2)1.8 and 1.8).02 among the patients with IHD and the non-IHD respectively (p= 0.001). Analysis shows that the proportion of HTN, DM, dyslipidemia and family history of CVD was higher among the pt. with IHD than the non IHD (p<0.05). (Table-IV).

Discussion:

The distribution of major cardiovascular risk factors among case and control revealed a statistically significant difference in terms of HTN, DM, dyslipiaedimia (p=0.001) and family history of CVD (p=0.003) indicating that the proportion of HTN, DM, dyslipidaemia and family history of CVD were higher among the MS than the control. The mean composite risk factors were found to be high among the cases (3.7±0.9) than the control (0.7±0.6) and

Table -I

Distribution of the patients by risk factors

Risk factors	Study Subjects				
	Case (n=50)		Control (n=50)		*p value
	No	%	No	%	
HTN					
Yes	49	98	2	4	0.001
No	1	2	48	96	
DM					
Yes	43	86	0	0	0.001
No	7	14	50	100	
Dyslipidemia					
Yes	47	94	0	0	0.001
No	3	6	50	100	
Smoking					
Yes	21	42	23	46	0.687
No	29	58	27	54	
Family H/O CVD					
Yes	24	48	10	20	0.003
No	26	52	40	80	
**Composite risk factors Mean ± SD (Range	3.7±0.9 (2-5)		0.7±0.6 (0-2)		0.001

*p value reached from chi square

**p value reached from unpaired student's tes

Table-II

Distribution of the Patients by labor-atory investigation

Lab. Invest-tigation	Study Subjects Case (n=50) No	%	Control (n=50) No	%	*p value
FPG (mg%)					
≥110	8	16	49	98	
>110	42	84	1	2	
Mean±SD (Range)	139.6±49.2 (80-309)		95.6±9.5 (74-122)		0.001
TG(mg%)					
≥150	4	8	16	32	
>150	46	92	34	68	
Mean ± SD (Range)	305.1±162.5 (110-748)		190.5±88.5 (68-517)		0.001
TC (mg%)					
≥200	21	42	31	62	
>200	29	58	19	380	
Mean ±SD (Range)	212.1±4 (117-324)		193.1±50.4 (106-333)		0.044
LDL (mg%)					
130	30	60	32	64	
>130	20	40	18	36	
Mean ±SD (Range)	117.3±38.4 (41-222)		118.4±42.1 (53-241)		0.894
HDL(mg%) Male					
<40	25	100	22	71	
≥40	0	0	9	29	
Mean ±SD (Range)	32.8±5.2 (21-39)		36.5+9.2 (21-54)		0.088
HDL (mg%) Female					
<50	24	96	18	94.7	
≥50	1	4	1	5.3	
Mean ± SD (Range)	35.7±8.8 (22-59)		36.8±8.4 (24-61)		0.675

*p value reached from unpaired student's t test

the difference was statistically significant p= 0.001. Among the risk factors HTN was most prevalent 98 followed by dyslipidaemia 94, DM 86, family history of CVD (48%) and smoking (42%) in cases. F. Azizi et. al. found the risk factors dyslipidaemia 91, HTN (72%), Obesity (69%), DM 25.7 in MS13. Zeller et. al. found HTN 79% and family history of CVD 32%14.

Table-III

Distribution of the patients by changes in ECG and IHD.

Varia-bles	Study Subjects Case (n=50) No	%	Control (n=50) No	%	*p value
IHD					
Yes	20	40	8	16	0.008
No	30	60	42	84	

*p value reached from Chi square test

Fasting hyperglycemia is a component of MS for ATP III criteria. In this study serum mean fasting glucose was 139.649.2 mg which is significantly higher among the cases than the control p=0.001. Ramachandran et. al. found mean FPG 126 mg8. Zeller et al. also found similar significant difference in FPG level among the patient with or without MS14. In this study raised fasting glucose was found in 84%. Deepa et. al. found raised fasting glucose in 14.7%15.

The lipid profile of this study shows that- among the MS group the mean TC were 212.1⊠42.0 mg/dl, LDL cholesterol were 117.3 ⊠38.4 mg/dl, TG were 305.1 ⊠162.5 mg/dl, HDL cholesterol were 32.8⊠ 5.2 mg/dl respectively. Vijay Achari has found the mean TC 205.3⊠ 31.7mg/dl, LDL-C 121.6 ⊠31.8 mg/dl, TG 167.39⊠ 99.8mg/dl, HDL-C 43.65⊠8.32 mg/dl respectively which almost support the findings of the present study16. The high TG level in this study may be due to lifestyle and dietary

habit of the study population as the use of saturated fat and hydrogenated fat (eg- Dalda) is high in this area.

In this study proportion of IHD was found to be high among the MS⊠40⊠⊠ compared to control ⊠16⊠⊠ and the difference was statistically significant ⊠p=0.008⊠ indicating there is a relationship between MS and IHD. Iraj Nabipour et al17, found that among the northern Persian Gulf adults, there was a highly significant association between MS and resting ECG evidence of IHD. This association remained after controlling of sex and age and provide information on IHD and MS using resting ECG

Table-IV

Distribution of the patients by risk factors and IHD

Risk factors	Case (n=50)		Control (n=50)		*p value
	No	%	No	%	
HTN					
Yes	20	39.2	31	60.8	
No	8	16.3	41	83.7	
DM					
Yes	18	41.9	25	58.1	
No	10	17.5	47	82.5	
Dyslipidaemia					
Yes	20	42.6	27	57.4	
No	8	15.1	45	84.9	
Smoking					
Yes	15	34.1	29	65.9	
No	13	23.2	43	76.8	
Family H/O CVD					
Yes	16	47.1	18	52.9	
No	12	18.2	54	81.8	
**Composite risk factors					
Mean±SD	3.2±1.8		1.8±.02		
(Rang)	(0-5)		(0-5)		

*p value reached from chi square

**p value reached from unpaired student's t test

abnorm-alities suggestive of IHD11. The prevalence of IHD in MS Pt. were 55.6%; and 23.8% according to Vijay Achari;16 and Deepa et. al.15 which support the finding of this study.

The mean composite risk factors was 3.2⊠1.8 among the patients with IHD and 1.8⊠.02 among the non-IHD. Proportion of HTN ⊠39.2⊠⊠, DM ⊠41.9⊠⊠, dyslipidaemia ⊠42.6⊠⊠ and family history of CVD ⊠47.1⊠⊠ was higher among IHD than the non IHD patients and difference was statistically significant ⊠p<0.05⊠. Iraj Nabipour et al17, found that of the MS components, elevated blood sugar (OR=2.69, p<0.001), high BP (OR=1.79, p=0.001) and low HDL cholesterol (OR=1.27, p =0.02) had significant independent association with IHD. Vijay Achari16 has found that HTN, Obesity, raised TG level and low HDL level had significant association with IHD. In this study the correlation between IHD and selected variables of MS shows that IHD is significantly positively correlated with MS, composite cardiovascular risk factors, ⊠p<0.05⊠. However, no statistically significant correlation was found between IHD and fasting blood sugar and lipoprotein profiles ⊠p>0.05⊠. On the contrary, the MS positively significantly correlated with composite cardiovascular risk factors, FPG level, TG and TC ⊠p<0.05⊠ and negatively correlated with HDL, LDL and female sex, but

risk factors, FPG level, TG and TC ⊠p<0.05⊠ and negatively correlated with HDL, LDL and female sex, but the correlation was not statistically significant ⊠p>0.05⊠. Snehalatha et. al. has similar findings9.

Association between MS components and prevalent IHD were investigated in a cross-sectional, community-based study of elderly men and women in Rancho Bernardo, California, in 1984–1987; in this study, there was also a significant association between resting ischemic ECG and all common components of the MS.11 In prospective data from the Bruneck Study/Italy which also used a 12-lead ECG at the baseline and at the follow-up, subjects with MS had an increased incidence of CHD during follow-up: 8% vs. 3% in control subjects18. Comparing prevalence of MS among persons with IHD and without IHD in middle-aged Kaunas population/ Lithuania, MS was associated with IHD in men aged 45–64 years19. Iraj Nabipour et al17 found a positive association between increasing number of ATP III MS components and IHD by ECG, their analysis indicate that the individual components of elevated FPG, elevated BP and low HDL cholesterol have significant association with ECG evidence of IHD.

Conclusion :

MS is common in Bangladeshi population as in other countries of South East Asia.

In this study IHD was found to be high among the MS (40%) compared to control (16%) and the difference was statistically significant (p=0.008) indicating there is a relationship between MS and IHD. Among the components of MS proportion of HTN(39.2%), DM (41.9%), dyslipidemia (42.6%) and family H/O CVD (47.1%) had significant higher association with patients with IHD.

There are certain limitation of this study . The use of population based sample would provide greater support for such type of study. Large multi-centre study need to confirm the findings of this study. Still we believe this study will help in many respects for the future researcher.

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