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Research Article

Metabolic Risk Markers in Insulin Resistance and Non-Insulin Resistance Type 2 Diabetes Mellitus

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Abstract

Aim: Type 2 diabetes mellitus (T2DM) is the most common metabolic disorder and its pathogenesis is characterized by a combination of peripheral insulin resistance and impaired insulin secretary capacity of pancreatic β cell. Over the years, there has been increasing deaths from T2DM. In Myanmar, there is little information on its causes, due to few published data on the prevalence of MS and its association with T2DM. This study aims at identifying the metabolic risk markers leading to MS in T2DM, as well as the impact of MS on the insulin resistance.

Methods: Hundred T2DM patients were recruited from Diabetic Clinic, Yangon General Hospital. The clinical evaluation consisted of waist circumference, blood pressure, height and weight measurements; the biochemical analysis included determination of fasting plasma glucose, serum insulin and fasting lipid profile. Plasma glucose level was determined by the glucose oxidase method and fasting serum insulin was measured by enzyme linked immunoassay (ELISA) kit method. Insulin resistance (HOMA IR) was calculated using formula by Matthews et al in 1985. Metabolic syndrome was defined as International Diabetes Federation (IDF) criteria.

Results: In the present study, MS was not significantly associated with insulin resistance (84.72% in the insulin resistance group vs 75% in the non-insulin resistance group). There were no significant differences in metabolic risk markers between the insulin resistance and non- insulin resistance groups. Present study showed 80% of insulin resistance male patients and 85% of insulin resistance female patients had MS, and also 83% of non-insulin resistance male patients and that of female patients had 64% of MS, respectively. There was no significant association between each group.

Conclusion: Metabolic syndrome was found in 83 patients in the present study, and of which 61 patients were found to show insulin resistance. Metabolic syndrome was not significantly associated with presence or absence of insulin resistance.

Keywords: Insulin resistance, Metabolic syndrome, Metabolic risk markers, Type 2 diabetes mellitus

Introduction

Obesity, in particular excess visceral adiposity, is associated with insulin resistance (IR), hyperglycaemia, dyslipidaemia and hypertension, which together are termed "metabolic syndrome" (MS). These metabolic disorders increase the risk of development of type 2 diabetes mellitus (T2DM) and cardiovascular diseases and contribute to high rates of mortality and morbidity.[1] Insulin resistance-linked obesity is caused by poor dieting and lack of regular exercise. Other genetic or lifestyle risk factors lead to the MS.

Association between insulin resistance and lipid parameters is

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also conflicting. In Campos's study,[2] HOMA-IR was not associated with TC, TG, HDL and LDL cholesterol levels. However, Baroni[3] reported that insulin resistance is generally associated with increased triglyceride concentrations. Fasting insulin and HOMA-IR were inversely associated with HDL cholesterol in some population and reduced HDL cholesterol levels are a feature of insulin resistance.[4]

According to WHO estimation, the prevalence of diabetes mellitus in Myanmar was 2.4% in 1995 and it will be 3.2% in the year 2025.[5] Over the years, there has been increasing deaths from T2DM. Locally, there is little information on its causes, due to few published data on the prevalence of MS and its association with T2DM. This study aims at identifying the metabolic risk markers leading to MS in T2DM, as well as the impact of MS on insulin resistance.

Materials and Methods

Hundred T2DM patients were recruited from Diabetic Clinic, Yangon General Hospital. The clinical evaluation consisted of waist circumference, blood pressure, height and weight measurements; the biochemical analysis included determination of fasting plasma glucose, serum insulin and fasting lipid profile. Plasma glucose level was determined by the glucose oxidase method and fasting serum insulin was measured by enzyme linked immunoassay (ELISA) kit method. Homeostasis model assessment index for insulin resistance (HOMA IR) was calculated using formula by Matthews[6] in 1985.Overweight and obesity were defined according to WHO guideline,[7] overweight as BMI≥25kg/m^2, obesity as BMI≥30kg/m^2. Metabolic syndrome was defined as International Diabetes Federation (IDF) criteria.[8] Data were analysed by SPSS (version 16.0) statistical software. Data were presented as mean value±standard deviation (SD) and analysed by Fisher exact test, the difference was considered significant when p value is <0.05.

Results

Metabolic risk markers in insulin resistance and non-insulin resistance groups. There were no significant differences in metabolic risk markers between the insulin resistance and non-insulin resistance groups (Table 1).

Metabolic syndrome distribution in insulin resistance and non insulin-resistance T2DM

Metabolic syndrome was found in 83 patients in the present study, and of which 61 patients was found to show insulin resistance. Metabolic syndrome was not significantly associated with presence or absence of insulin resistance. In the present study, both insulin resistance and non-insulin resistance group, between 40-50% were found to have 4 components of metabolic syndrome, followed by over 35% of the study group having all metabolic components. Those without metabolic syndrome were 11 and 6 in insulin resistance and non-insulin resistance group, although there were only one each in both group who has only 2 metabolic components. (Table 2)

Metabolic components in insulin resistance and non- insulin resistance groups without metabolic syndrome

Table 3 shows that 3 metabolic risk markers are present in 8 patients without MS and in 7 patients, 4 metabolic risk markers are present. These data suggest that other metabolic risk parameters could be present without the central obesity.

Table 1: Metabolic risk markers in insulin resistance and non-insulin-resistance groups.

Metabolic Risk Markers	IR+mean±SD (n=72)	IR-mean±SD (n=28)	Remark
Waist circumference (cm)	94.37±12.31	95.42±13.39	NS
Systolic blood pressure (mmHg)	136.25±20.49	134.57±21.15	NS
Diastolic blood pressure (mmHg)	82.43±10.34	82.83±8.09	NS
Fasting blood sugar (mg/dL)	153.65±66.25	129.39±40	NS
Triglyceride (mg/dL)	187.65±36.05	193.43±43.71	NS
HDL (mg/dL)	37.95±7.64	36.65±8.48	NS

NS: not significant

Table 2: Distribution of metabolic syndrome and its components in insulin resistance and non- insulin resistance T2DM.

Metabolic syndrome	IR+(n=72) Number (%)	IR-(n=28) Number (%)	Remark
Presence	61 (84.72%)	22 (75%)	NS
Absence	11 (15.27%)	6(25%)	NS
2 components	1 (1.38%)	1 (3.57%)	NS
3 components	12 (16.66%)	3 (10.71%)	NS
4 components	30 (41.66%)	15 (53.57%)	NS
5 components	29 (40.27%)	9 (32.14%)	NS

NS: not significant

Metabolic syndrome and metabolic components in insulin resistance and non-insulin resistance male and female patients

Table 4 showed 80% of insulin resistance male patients and 85% of insulin resistance female patients had MS, and also 83% of non-insulin resistance male patients and that of female patients had 81% of MS, respectively. There was no significant association between each group.

Table 4 Metabolic syndrome and metabolic components in insulin resistance and non-insulin resistance male and female patients.

Table 3: Metabolic components in insulin resistance and non insulin resistance groups without metabolic syndrome.

Components	IR+, MS-(n=11)	IR-, MS-(n=6)
2 components	1	1
3 components	6	2
4 components	4	3

Table 4: Metabolic syndrome and metabolic components in insulin resistance and non-insulin resistance male and female patients.

Metabolic syndrome	IR+Male (n=25) Number (%)	IR+Female (n=52) Number (%)	IR-Male (n=12) Number (%)	IR-Female (n=11) Number (%)
Presence	20 (80.00)	44 (84.62)	10 (83.33)	9 (81.81)
Absence	5 (20.00)	8 (15.38)	2 (16.67)	2 (18.18)
1 component	1 (4.00)	0 (0.00)	0 (0.00)	0 (0.00)
2 components	1 (4.00)	1 (1.92)	1 (8.33)	0 (0.00)
3 components	9 (36.00)	11 (21.15)	1 (8.33)	3 (27.27)
4 components	9 (36.00)	23 (44.23)	7 (58.33)	5 (45.45)
5 components	5 (20.00)	17 (32.69)	3 (25.00)	3 (27.27)

Discussion

Metabolic syndrome in type-2 diabetes mellitus

The prevalence of MS seems to vary among different study population based on the presence of risk factors including BMI, life styles, ethnicity, race, age and sex. It was 83% in the present study, 85% in Scott et al study (2011),[8] 59.5% in Ranjith,[9] 54.2% in Rojas,[10] 64.6% in Chung Hua.[11]

The prevalence of MS was found varied when the criteria used for the diagnosis for MS were different. Using the clinical definitions, namely the original NCEP-ATP III, the prevalence of MS in the Philippines in 2003 was 11.9%. It became 18.6% when the modified AHA/NHLBI criteria were used.[12] Similarly, the prevalence of MS as defined by the NCEP ATP III criteria was 60.4% whereas it was close to it, but not exactly the same, 59.5% in young Indian patients when the IDF criteria were used.[9]

In the present study, MS was not significantly associated with insulin resistance (84.72% in the insulin resistance group vs 75% in the non-insulin resistance group). Such absence of association between MS and insulin resistance was reported also by Ranjith[9] in 2008. However MS was not significantly associated with presence or absence of insulin resistance, the components of MS in insulin resistance group was higher than non-insulin resistance group (Table 2) but not reached significant level. The limitation of the present study is sample size population, the present study participated only hundred T2DM subjects.

Metabolic risk components such as WC, FBS, and lipid parameters were not significantly different between insulin resistance and non-insulin resistance patients (Table 1), and that finding was in consistence with the finding of Garg study[13] in 2011 and Khin Saw Than[14] in 2012 except that in the latter study, WC and FBS were significantly higher in insulin resistance than in non-insulin resistance patients. In the present study FBS level was higher in insulin resistance group than non- insulin resistance group (153.65±66.25vs129.39±40), but that value does not reached significant level which may be due to inclusion criteria of the study. The present study included overweight and obese T2DM who were taking metformin drug only.

Regarding the components of MS, 45% were found to have 4 components, followed by 38% having all metabolic components in (Table 2). The central obesity was not present in some cases despite the presence of other metabolic risk parameters because their BMI are not more 26 and overweight patients. Those without MS were 11 and 6 in insulin resistance and non-insulin resistance group, respectively. There was only one each in both groups who has only 2 metabolic components (Table 3). Although the patients without MS, most of the patients had 3 or 4 metabolic components because the study included overweight and obese patients.

Nsiah k[15] showed higher prevalence of MS in female (77.01%) than male subjects (22.99%), which was not consistent with the present study, 80% of insulin resistance male patients and 85% of insulin resistance female patients had MS, and also 83% of non-in-

sulin resistance male patients and that of female patients had 81% of MS, respectively. The reason may be due to a relatively sedentary lifestyle of the patients in the present study most of them are traders or unemployed.

The present study has shown an increased prevalence of MS (83%), the most prevalent component was hypertension, followed by central obesity, low HDL-C and hypertriglyceridemia. Low educational status and obesity also have great predictive effects on MS in the type 2 diabetics.

Conclusion

Metabolic syndrome was found in 83 patients in the present study, and of which 61 patients were found to show insulin resistance. Metabolic syndrome was not significantly associated with presence or absence of insulin resistance and also metabolic risk markers were not significantly associated with presence or absence of insulin resistance.

Limitation of the Study

One of the limitation is all the patients were recruited from Diabetes Clinic, Yangon General Hospital, so all patients received lipid lowering agents from clinic, actually when the present study considered metabolic components, we need to exclude the patients without taking lipid lowering agents. Second one is small sample size, we can do only 100 patients.

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Conflicts of Interest

The authors declare no conflicts of interest.

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