

## RISK OF METABOLIC SYNDROME: A COMPARISON AMONG HYPERTENSIVE AND NON-HYPERTENSIVE SUBJECTS

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### **Introduction**

Hypertension is a major health risk factor attributing to the increase in global morbidity and mortality, in both developed and developing countries. It is reported that the prevalence of hypertension is higher in low-income countries. A Sri Lankan study found a prevalence of 28.36 % among a study population in 2009 [1]. Hypertension is not only a major risk factor of cardiovascular diseases (CVD) that attribute to about one third of all deaths worldwide, but is also considered as a key feature of the metabolic syndrome (MS), accounting for nearly 85 % among people with MS. Other common features of MS are atherogenic dyslipidaemia and hyperglycaemia. Abdominal obesity and insulin resistance have been identified as the predominant underlying risk factors for MS.

Various criteria used to predict MS are based on above mentioned metabolic risk factors [2]. Worldwide prevalence of MS has increased significantly over the past two decades. Studies have shown approximately 20 -25 % of world's adult population have MS and they are prone to have a threefold greater risk for CVD morbidity and fivefold greater risk for developing type 2 diabetes mellitus (T2DM). In addition, prevalence of MS among Sri Lankan adults is increasing at an alarming rate, where one fourth of the Sri Lankan population were affected during the year 2005-2006 [3]. Many studies have focussed on the importance of preventing MS in order to reduce morbidity and mortality [2]. As hypertension is a key feature of MS and could be measured easily, this could be used as an important screening tool to detect MS. Hence, the aim of the present study was to compare the presence of characteristic features of MS in a population of hypertensive and non-hypertensive males and females according to National Cholesterol Education Program Adult Treatment Panel III (ATP III) and new International Diabetic Federation (IDF) criteria and to find out the percentage of MS with both criteria. Further, as subjects in their fourth to sixth decades are affected mostly with hypertension; subjects within the age range of 35- 55 years were selected for this study.

According to the IDF criteria, MS is defined as the presence of large waist line (central obesity): waist circumference (WC)  $\geq$  90 cm for South Asian men and  $\geq$  80 cm for South Asian women plus any two of the following four features [2].

1. High triglyceride level:  $\geq$  150 mg/dL (1.7 mmol/L), or obtaining treatment for high TG.
2. Decreased high density lipoprotein cholesterol (HDL):  $<$  40 mg/dL for male,  $<$  50 mg/dL for female, or obtaining treatment for low HDL cholesterol
3. Raised blood pressure (BP): systolic BP  $\geq$  130 mm Hg or diastolic BP  $\geq$  85 mm Hg, or obtaining treatment for hypertension
4. Increased fasting blood sugar (FBS) level:  $\geq$  100 mg/dL (5.6 mmol/L) or obtaining treatment for high blood sugar.

According to the ATP III criteria, MS is defined as the presence of at least 3 of the above mentioned 5 features.

## Materials and methods

### Study design and participants

A case control study was carried out at the Family Practice Centre of University of Sri Jayewardenepura, Nugegoda. The study was approved by the Ethics review committee of Faculty of Medical Sciences, University of Sri Jayewardenepura. This study involved 120 participants in the age range of 35-55 years. Informed written consent was obtained from all the participants prior to inclusion in the study. Hypertensive adults (diagnosed as hypertension >140/90 mmHg and/or on antihypertensive drugs) were included in the 'Test' group and non-hypertensive adults who were not diagnosed for hypertension and with normal blood pressure <120/80 mmHg, were included in the 'Control' group. Subjects who were pregnant, having severe diseases, having physical impairments and who disliked to participate in the study were excluded. Among the 120 subjects, 60 were hypertensive. The female and male distribution in each hypertensive and non-hypertensive groups were similar (n=30).

For the analysis of FBS, 10 hours of overnight fast and for triglycerides and HDL cholesterol 12 hours of overnight fasting period was considered. About 1 mL blood was drawn after 10 hours of overnight fast and collected into an Eppendorf tube containing NaF for analysis of FBS using Biorex diagnostics, Glucose kit. (The cut off value for FBS is >100 mg/dL) [2]. For lipid profile (triglycerides, HDL), 3 mL of blood was collected into properly labelled centrifuge tubes. Analysis was done using Stanbio cholesterol LiquiColor kit. (The cut off value for TG is >150 mg/dL, HDL is < 40 mg/dL for men and <50 mg/dL for women) [2]. Blood pressure was measured using a mercury sphygmomanometer by a qualified medical professional. WC was measured according to the standard method using a validated non stretchable commercial tape. (WC ≥ 90 cm for South Asian men and ≥ 80 cm for South Asian women) [2]. Percentages of MS among hypertensive and non-hypertensive groups were determined according to both ATP III and IDF criteria.

### Statistical analysis

Means, frequencies and significance of difference in each parameter between hypertensive group and non-hypertensive group were analysed using statistical package for social sciences (SPSS) version 21. In the statistical analysis, P <0.05, was considered as the level of significance.

## Results and discussion:

Table 1: Mean values of biochemical and anthropometric parameters.

parameter	Hypertensive group		Non-hypertensive group	
	Mean ± Standard Deviation		Mean ± Standard Deviation	
	Male	Female	Male	Female
FBS (mg/dL)*	101.1±26.9*	114.5±68.9*	79.4±15.4	100.8±48.00
WC (cm)	95.0±8.6*	90.6±8.1	88.0±7.7	86.6±9.0
TG level (mg/dL)	131.4±114.5	123.6±55.5*	122.3±56.8	87.6±36.9
HDL cholesterol level (mg/dL)	41.4±8.9	47.4±10.0	38.4 ±8.0	46.1±7.3

[P < 0.050 was taken as significant. \*Difference is significant at 0.05 level]

Studies have observed an association between hypertension and diabetes [4]. People with hypertension have a higher risk for developing diabetes. The present study findings support the above fact by showing a significantly higher mean FBS in the hypertensive group compared to the non-hypertensive group ( $p < 0.05$ ).

Table 2: Percentage of subjects with biochemical and anthropometry parameters beyond the risk cut off value.

Parameters	Hypertensive group		Non-hypertensive group	
	Male	Female	Male	Female
FBS	40.0 %	26.7 %	6.7 %	13.3 %
WC	70.0 %	90.0 %	40.0 %	76.7 %
TG level	28.0 %	30.0 %	28.0%	10.0 %
HDL cholesterol level	44.0 %	6.7 %	60.0%	0

According to a report of ATP III, hypertension is associated with elevated triglycerides. In the present study too hypertensive group showed a higher average triglyceride value compared to the non-hypertensive group.

Many studies have found a close association between obesity and hypertension. Central obesity is strongly associated with hypertension. It is suggested that characteristic hyperinsulinemia in obesity, mainly central obesity, lead to the development of hypertension by sodium retention and activating the sympathetic nervous system. Central obesity which is measured by WC is considered as one of the main underlying factors and one of the main features of MS [4]. Therefore, central obesity can be considered as a better indicator to determine the risk for MS. In the present study WC was used to measure central obesity and it was significantly higher in the male hypertensive group compared to the male non-hypertensive group while the mean WC was higher than the risk cut off value in both hypertensive and non-hypertensive females.

Table 3: Number of subjects with MS according to IDF and ATP III

MS	IDF including hypertension	IDF without including hypertension as a feature of MS	ATP III including hypertension	ATP III without including hypertension as a feature of MS
hypertensive	30*	12	36*	13
non-hypertensive		4		6

According to IDF criteria to determine MS, among 60 hypertensive subjects, 30 subjects (50 %) had MS where it was only 4 subjects (6.67 %) in the non-hypertensive group. According to ATP III criteria, among 60 hypertensive subjects, 36 subjects (60 %) had MS while it was only in 6 (10 %) subjects in the non-hypertensive group. The percentage of subjects with MS was significantly higher in the hypertensive group when compared to the non-hypertensive group according to both ATP III and IDF criteria, ( $p < 0.05$ ). There was no significant difference between male and female hypertensive groups with regard to the MS percentage. Studies have reported that,

the prevalence of MS in hypertensive patients is higher than in non-hypertensive subjects, which support the findings of the present study [5].

#### **Conclusion and recommendation**

Significantly higher mean values of FBS were observed among both male and female hypertensive groups compared to non- hypertensive groups while mean WC was significantly higher in hypertensive males and mean TG level was significantly higher in hypertensive females. Percentage of subjects with MS was significantly higher in the hypertensive group compared to the non-hypertensive group according to both ATP III and IDF criteria.

These findings emphasize the urgent need to develop national strategies for the early detection, adoption of preventive measures and also to make people aware of the impact of the metabolic syndrome on their health, in order to reduce the societal burden of cardiovascular disease morbidity and mortality.

#### **References**

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