Frequency of Asymptomatic Peripheral Disease in Patients of Metabolic Syndrome

ATIF MASOOD, KHURRAM SALEEM, AYUB LATIF KHAWAJA, *MUHAMMAD NAEEM AMIN, MUNIBULLAH MIRZA,SAJJID SATTAR BUTT, NAJEEBULLAH, SADIA IQBAL, MUHAMMAD ATIF, AMBER SALEEMI, SANA HUMAYUN, MUHAMMAD SHIRAZ KHAN SADIQ*

ABSTRACT

Objective: To determine the frequency of asymptomatic peripheral arterial disease (PAD) in subjects with metabolic syndrome.
Study design: Descriptive case series study.
Setting: This study was conducted in outpatient department of Medicine, Mayo Hospital Lahore.
Duration: Six months
Subjects: A total of 110 patients with metabolic syndrome were selected for this study. Ankle Brachial Index was calculated by measuring the systolic blood pressure (by Doppler probe) in the brachial, posterior tibial, and dorsalis pedis arteries on both sides. The highest of the four measurements in the ankles and feet is divided by the higher of the two brachial measurements to get ABI. The cut off value for ankle brachial index to diagnose peripheral arterial disease was <0.9.
Results: The mean age of the patients was 51.6±8.9 years. There were 63(57.3%) male patients and 47(42.7%) female patients. There were 79(71.8%) patients having history of diabetes mellitus and 66 (60%) patients having history of hypertension. The mean ankle brachial index of the patients was 0.95±0.046. There were 14(12.7%) patients of ankle brachial index of <0.90 and 96(87.7%) patients of ankle brachial index of $\geq$0.90. In the distribution of peripheral arterial disease, there were 14(12.7%) patients in whom PAD was present and 96(87.7%) patients in whom PAD was absent.
Conclusion: The metabolic syndrome is associated with increased risk of vascular events in peripheral arterial disease patients.
Key words: Metabolic syndrome, peripheral arterial disease (PAD), ankle brachial index (ABI)

INTRODUCTION

Metabolic Syndrome is central adiposity on the basis of waist circumference with two or more of the four factors including triglycerides, reduced HDL cholesterol, elevated blood pressure, and dysglycemia[1]. Metabolic Syndrome incidence was 35.2% among adults visiting outpatient clinic in Agha Khan University (AKU) Karachi[2], 46% at Ziauddin Medical University Hospital[3] and almost 40% of U.S. adults were diagnosed as having the metabolic syndrome[1].

Asymptomatic peripheral arterial disease, as indicated by a reduced ankle brachial systolic pressure index (ankle brachial index (ABI) <0.90)[5] is associated with presence of diffuse atherothrombotic disease[4] and predicts risk of cardiovascular death, myocardial infarction and stroke[6], therefore its measurement is useful to reclassify a significant proportion of patients without previous known atherothrombotic disease as high risk[7]. Peripheral arterial disease can be non-invasively and reliably

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*Department of Medicine, Sir Ganga Ram Hospital, Lahore
Correspondence to Dr. Khurram Saleem, Senior Registrar, Email: khurramsaleem@hotmail.com*

diagnosed with the ankle-brachial index, a ratio of Doppler-recorded systolic pressures in the lower and upper extremities[8]. Many large studies, like VITAMIN study[9]. Edinburgh Artery Study[10], Study from Heart, Lung and Blood Vessel Centre, China[11] have authenticated the diagnostic efficacy of ABI to predict atherosclerosis having sensitivity of 95% and specificity of 99% in identifying peripheral arterial disease when compared with arteriography[6].

The major components of metabolic syndrome are atherogenic dyslipidaemia (AD) and insulin resistance (IR) as judged by body mass index, waist hip ratio and waist circumference. Being able to demonstrate asymptomatic peripheral arterial disease at an early stage of Metabolic Syndrome can potentially change our day-to-day clinical decision making in subjects with metabolic syndrome.

Metabolic Syndrome (International Diabetes Federation 2005): Central adiposity (defined as waist circumference in males>90cms, females>80cms) with two or more of the following:

1. Serum Triglycerides: >150 mg/dl or specific treatment for this lipid abnormality.

2. HDL-Cholesterol: <40 mg/dl in men and <50 mg/dl in women or specific treatment for this lipid abnormality.
3. Raised Blood Pressure: >130/85 mmHg or treatment of previously diagnosed hypertension.
4. Fasting Plasma Glucose concentration: >100 mg/dl or previously diagnosed type 2 diabetes.[1]

(For Serum Triglyceride level, serum HDL-Cholesterol level and Fasting plasma glucose level determination, 5cc venous blood sample taken after 12-14 hours fasting, will be analysed by Microlab 300)

MATERIALS AND METHODS

This descriptive case series study was conducted during 6 months with non-probability purposive sampling technique in Medical Outdoor Clinics of Mayo Hospital, Lahore. The calculated sample size on 5% margin of error, with 95% confidence interval taking 7.3% prevalence of asymptomatic peripheral arterial disease in subjects with metabolic syndrome, is 110. Patients of both genders of the age of 40 and above with metabolic syndrome consistent with operational definition were included in the study. Smoker patients with positive family history of hypertension, chronic kidney, liver heart diseases, active coronary artery disease, hematological and solid organ malignancies, symptomatic peripheral arterial disease and pregnancy were excluded from the study.

A total of 110 patients with metabolic syndrome, diagnosed according to operational definition were selected from medical outdoor clinics of Mayo Hospital, Lahore. Informed consent was taken for measurement of ankle brachial index. Patient's identity was kept confidential. Risk and benefits were explained to the subjects. All the subjects were interviewed for demographic information and for history of diabetes mellitus and hypertension. Effect modifiers such as age, history of diabetes mellitus and hypertension were controlled through stratification. Ankle Brachial Index was calculated by measuring the systolic blood pressure (by Doppler probe) in the brachial, posterior tibial, and dorsalis pedis arteries on both sides. The highest of the four measurements in the ankles and feet is divided by the higher of the two brachial measurements to get ABI. The cut off value for ankle brachial index to diagnose peripheral arterial disease was <0.9. All data was collected on a pre-designed proforma (attached). Data was analyzed using SPSS 10.0

RESULTS

One hundred and ten patients with metabolic syndrome, diagnosed according to operational definition were selected from medical outdoor clinics

of Mayo Hospital, Lahore. The mean age of the patients was 51.6±8.9 years. There were 56(50.9%) patients in the age range of 40-50 years, 34(30.9%) patients of 51-60 years, 18 (16.4%) patients of 61-70 years and 2(1.8%) patients of age range of 71-80 years (Table 1).In the distribution of sex, there were 63(57.3%) male patients and 47(42.7%) female patients (Table 2). On the history, there were 79(71.8%) patients having history of diabetes mellitus and 66(60%) patients having history of hypertension (Table 3). The mean systolic blood pressure of the patients was 128.4±16.0mmHg (Table 4). The mean diastolic blood pressure of the patients was 80.1±8.1mmHg (Table 5). The mean right brachial systolic blood pressure of the patients was 126.0±14.9 mmHg (Table 6). The mean left brachial systolic blood of the patients was 126.3±15.3mmHg (Table 7).The mean right dorsalis pedis systolic blood pressure of the patients was 118.1±13.8mmHg (Table 8). The mean right posterior tibial systolic blood pressure of the patients was 119.3±13.3mmHg (Table 9). The mean left dorsalis pedis systolic blood pressure of the patients was 118.6±13.2mmHg (Table 10). The mean left posterior tibial systolic blood pressure of the patients was 119.3±13.2 mmHg (Table 11).The mean ankle brachial index of the patients was 0.95±0.046. There were 14(12.7%) patients of ankle brachial index of <0.90 and 96(87.7%) patients of ankle brachial index of ≥0.90 (Table 12).In the distribution of peripheral arterial disease, there were 14(12.7%) patients in whom PAD was present and 96 (87.7%) patients in whom PAD was absent (Table 13). In the comparison of PAD with age, there were 2(1.9%) patients with PAD present in age range of 40-50 years, 7(6.4%) patients with PAD present in age range of 51-60 years, 4(3.6%) patients with PAD present in age range of 61-70 years and 1(0.9%) patients with PAD present in age range of 711-80 years (Table 14).In the comparison of PAD with history of diabetes mellitus, there were 13 (11.8%) patients of PAD having history of diabetes mellitus and 66 (60%) patients of not PAD having also history of diabetes mellitus (Table 15). In the comparison of PAD with history of hypertension, there were 10(9.1%) patients of PAD having history of hypertension and 56(50.9%) patients of not PAD having also history of hypertension (Table 16).

Tab 1: Distribution of patients by age (n=110)

Age (Years)	=n	%age
40-50	56	50.9
51-60	34	30.9
61-70	18	16.4
71-80	2	1.8
Mean±SD	51.6±8.9	

Key: SD   Standard deviation

Table 2: Distribution of patients by sex (n=110)

Gender	=n	%age
Male	63	57.3
Female	47	42.7
Total	110	100.0

Table 3: Distribution of patients by history(n=110)

	Diabetes mellitus	Hypertension
Yes	79(71.8%)	66(60%)
No	31(28.2%)	44(40%)

Table 4: Distribution of pts by systolic BP (n=110)

SBP (mmHg)	=n	%age
100-120	44	40.0
121-140	48	43.6
141-160	16	14.6
>160	2	1.8
Mean±SD	128.4±16.0	

Key: SD   Standard deviation
SBP   Systolic blood pressure

Table 5: Distribution of patients by diastolic BP (n=110)

DBP (mmHg)	=n	%age
70-80	77	70.0
81-90	26	23.7
91-100	7	6.3
Mean±SD	80.1±8.1	

Key: SD   Standard deviation
DBP   Diastolic blood pressure

Table 6: Distribution of patients by right brachial systolic blood pressure (n=110)

RBSBP (mmHg)	=n	%age
Upto 100	3	2.7
101-120	41	37.3
121-140	48	43.6
141-160	18	16.4
Mean±SD	126.0±14.9	

Key: SD: Standard deviation
RBSBP: Right brachial systolic blood pressure

Table 7: Distribution of pts by left brachial systolic BP

LBSBP (mmHg)	=n	%age
Upto 100	3	2.7
101-120	43	39.1
121-140	47	42.7
141-160	17	15.5
Mean±SD	126.3±15.3	

Key: SD: Standard deviation
LBSBP: Left brachial diastolic blood pressure

Table 8: Distribution of patients by right dorsalis pedis systolic blood pressure (n=110)

RDPSBP (mmHg)	=n	%age
Upto 100	5	4.5
101-120	62	56.4
121-140	37	33.6
141-160	6	5.5
Mean±SD	118.1±13.8	

Key: SD: Standard deviation
RDPSBP: Right dorsalis pedis systolic blood pressure

Table 9: Distribution of patients by right posterior tibial systolic blood pressure (n=110)

RPTSBP (mmHg)	=n	%age
Upto 100	3	2.7
101-120	60	54.5
121-140	38	34.6
141-160	9	8.2
Mean±SD	119.3±13.3	

Key: SD: Standard deviation
RPTSBP: Right posterior tibial systolic blood pressure

Table 10: Distribution of patients by left dorsalis pedis systolic blood pressure (n=110)

LDPSBP (mmHg)	=n	%age
Upto 100	3	2.7
101-120	60	54.5
121-140	40	36.4
141-160	7	6.4
Mean±SD	118.6±13.2	

Key: SD: Standard deviation
LDPSBP: Left dorsalis pedis systolic blood pressure

Table 11: Distribution of patients by left posterior tibial systolic blood pressure (n=110)

LPTSBP (mmHg)	=n	%age
Upto 100	4	3.6
101-120	56	50.9
121-140	43	39.1
141-160	7	6.4
Mean±SD	119.3±13.2	

Key: SD: Standard deviation
LPTSBP: left posterior tibial systolic blood pressure

Table 12: Distribution of pts by ankle brachial index (n=110)

ABI	=n	%age
<0.90	14	12.7
>0.90	96	87.3
Mean±SD	0.95±0.046	

Key: SD: Standard deviation   ABI: Ankle brachial index

Table 13: Distribution of patients by peripheral arterial disease

PAD	=n	%age
Present	14	12.7
Absent	96	87.3
Total	110	100.0

Key: PAD: Peripheral arterial disease

Table 14: Comparison of peripheral arterial disease with age

Age	Present	Absent
40-50	2(1.8%)	54(49.1%)
51-60	7(6.4%)	27(24.6%)
61-70	4(3.6%)	14(12.7%)
71-80	10(9%)	1(0.9%)
Total	14(12.7%)	96(87.3%)

Table 15: Comparison of peripheral arterial disease with history of diabetes mellitus (n=110)

History of diabetes mellitus	Present	Absent
Yes	13(11.8%)	66(60%)
No	1(0.9%)	30(27.3%)
Total	14(12.7%)	96(87.3%)

Table 16: Comparison of peripheral arterial disease with history of hypertension (n=110)

History of hypertension	Present	Absent
Yes	10(9.1%)	56(50.9%)
No	4(3.6%)	40(36.4%)
Total	14(12.7%)	96(87.3%)

DISCUSSION

Peripheral arterial disease is a distinct atherothrombotic syndrome marked by stenosis and occlusion of peripheral arterial beds, typically those in the lower extremities. Risk factors include smoking, hypertension, diabetes, hyperlipidemia, and physical inactivity[4]. Asymptomatic peripheral arterial disease, as indicated by a reduced ankle brachial systolic pressure index (ABI<0.90)[5] is associated with presence of diffuse atherothrombotic disease[4] and predicts risk of cardiovascular death, myocardial infarction and stroke[6], therefore its measurement is useful to reclassify a significant proportion of patients without previous known atherothrombotic disease as high risk[7]. The prevalence of vascular disease in subjects with Metabolic Syndrome is significantly higher than in those without it (29.4% vs 9.6%)[8]. The prevalence of a low ABI (<0.90) in asymptomatic peripheral arterial disease is also significantly greater in subjects with metabolic syndrome than those without it (7.3 vs. 2.5%)[6]. In our study the mean age of the patients was 51.6±8.9 years. As compared with the study of Achimastos et al[13]. The mean age of the patients was 45.3±15.5 years, which is comparable with our study. In another study conducted by Kim et al[14] the mean age of the patients was 58±8 years, which is also comparable with our study. In our study there were 57.3% male patients and 42.7% female patients. As compared with the study of Lemogoum et al[15] there were 60% male patients and 40% female patients, which is comparable with our study. In our study the frequency of peripheral arterial disease in metabolic syndrome was found in 12.7% patients. As compared with the study of Criqui et al[16] the prevalence of peripheral arterial disease in metabolic syndrome was found in 11.7% patients, which is almost same and comparable with our study. In another study conducted by Jahan et al[2] metabolic syndrome incidence was 35.2% among adults visiting outpatient clinic in Agha Khan University Karachi. While in our study the incidence of peripheral arterial disease in metabolic syndrome was in 12.7% patients. The above incidence is much greater than our study. In a study conducted by Lahoz et al[6] the prevalence of a low ABI (<0.90) in asymptomatic peripheral arterial disease is also significantly greater in subjects with metabolic syndrome than those without it (7.3 vs. 2.5%). As compared with our study the frequency of peripheral arterial disease in metabolic syndrome was in 12.7% patients, which is comparable with the above study. In another study conducted by Vasilios et al[7] the prevalence of vascular disease in subjects with metabolic syndrome is significantly higher than in those without it (29.4% vs 9.6%)[8]. While in our study the frequency of peripheral arterial disease in metabolic syndrome was in 12.7% patients, which is comparatively less with the above study. Because patients with peripheral arterial disease may be asymptomatic or may present with atypical symptoms or findings, the true population prevalence of PAD is essentially unknown. A total of 11.7% of the population had large-vessel PAD on noninvasive testing, and nearly half of those with large-vessel PAD also had small-vessel PAD (5.2%). An additional 16.0% of the population had isolated small-vessel PAD. Large-vessel PAD increased dramatically with age and was slightly more common in men and in subjects with hyperlipidemia. Isolated small-vessel PAD, by contrast, was essentially unrelated to sex, hyperlipidemia, or age, although it was somewhat less common before age 60. Intermittent claudication rates in this population were 2.2% in men and 1.7% in women, and abnormalities in femoral or posterior tibial pulse were present in 20.3% of men and 22.1% of women compared with the noninvasively assessed large-vessel PAD rate of 11.7%. Thus assessment of large-vessel PAD prevalence by intermittent claudication dramatically underestimated the true large-vessel PAD prevalence and assessment by peripheral pulse examination dramatically overestimated the true prevalence[16].

In Pakistan, not much work has been done on peripheral arterial disease in association with Metabolic Syndrome. Through this study I aim to find out the frequency of asymptomatic peripheral arterial disease with Metabolic Syndrome. Being able to demonstrate asymptomatic peripheral arterial disease at an early stage of Metabolic Syndrome, this may possibly be used as a surrogate marker for prevention of cardiovascular and cereberovascular diseases

CONCLUSION

In Pakistan, not much work has been done on peripheral arterial disease in association with Metabolic Syndrome. Through this study I aim to find out the frequency of asymptomatic peripheral arterial disease with Metabolic Syndrome. Being able to demonstrate asymptomatic peripheral arterial disease at an early stage of Metabolic Syndrome, this may possibly be used as a surrogate marker for prevention of cardiovascular and cereberovascular diseases.

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