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PREVALENCE OF PERIPHERAL VASCULAR DISEASE AT RISK POPULATION USING NON-INVASIVE TECHNIQUES IN A TERTIARY CARE CENTRE

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ABSTRACT

BACKGROUND: The term peripheral arterial disease (PAD) generally refers to a disorder that obtained the blood supply to lower or upper extremities. It is frequently associated with cerebral and coronary atherosclerosis.

METHOD: 200 patients coming to OPD and IPD in age group of 20-65 years with risk factors of HT, DM known CAD, known PAD, smoking were worked up.

RESULTS: Steep increase in prevalence of clinical PAD was found in 50 years or above, males predominated only slightly 32% than females 27,7% in clinical PAD. Every one patient was either hypertensive or diabetic, one-third had both Diabetes and hypertension, one third had dyslipidaemia, and one fifth had CAD. CAD was more prevalent in patients with clinical PAD 40% than without PAD 11.4%. Elevated triglyceride levels 150 mg/dl was more in patients clinical PAD 33.3% than without PAD 14.2%. Elevated total cholesterol levels 200 mg/dl was more in patients with clinical PAD 26.6% than without PAD 20%, 80% of patients with clinical PAD had d ABI <0.9, and out of patients with no clinical PAD 16% had abnormal PAD. Grading of ABI according to severity showed grater no of patients with ABI <0.8 and less in clinical PAD group.

CONCLUSION: - PAD was more prevalent with increasing age, diabetes mellitus, hypertension, smoking and dyslipidaemia.

Keywords: Ankle brachial index, CAD, Diabetes mellitus, Hypertension, Peripheral arterial disease, Smoking

INTRODUCTION: Peripheral artery disease (PAD) refers to obstructive disease of major arteries below the aortic bifurcation. Vast majority of PAD is caused by atherosclerosis. It is major cause of lower limb symptoms, disability and limb loss. With the rise in aging population, the prevalence of PAD is also on the increase. Most cases of PAD asymptomatic. Approximately a quarter of patients with PAD present with intermittent claudication (IC) and progress to critical limb ischemia with rest pain and gangrene leading to significant disability and limb loss.

Several studies have demonstrated that patients with asymptomatic as well as symptomatic PAD are at an increased risk of cardiovascular morbidity and mortality compared with subjects without PAD.

There have been large epidemiological studies on the prevalence and associations of PAD from the developed Western society. However, there has been no large selected study on the prevalence of PAD from Southern parts of India among population at risk. We sought to estimate the prevalence of PAD ankle brachial index.

AIM :

- To group the population as per different risk factors.
- To find the prevalence of peripheral arterial disease in population with different risk factors
- To compare and find the significance of various risk factors in patients with and without clinical diagnosis of PAD
- To find out ankle brachial index of each patient, to group patients according to ABI levels.

METHODS:

The patient is included in the study were those coming to OPD and IPD of Department of Surgery. 200 patients were included in the age group 20-65 years after taking consent to participate in the study.

Inclusion criteria

All cases were chosen between 20-65 year of age with one or more of the following risk factors.

- Diabetes mellitus type 1 and 2

- Hypertension
- Known coronary artery disease
- Known PAD
- Dyslipidemia
- Smoking
- Previous Cerebral-vascular accident

Patients were grouped according to the presence of risk factors, followed by complete physical examination with special attention to palpation of pulses, skin changes, temperature of limb and bruits. Routine investigations (HB, TLC, Platelets Blood urea, Urine complete examination, Lipid profile, ECG, Echocardiography, stress tests ABI) were done according to the standard protocol.

ABI measurement was taken in supine position after patient was given rest for five minutes in supine position using a bi-directional Doppler machine, a hand held 8 MHz probe and standard mercury sphygmomanometer measured Systolic blood pressure (SBP) was measures in following order: right brachial artery (RBA), right dorsalis pedis (RDP), right posterior tibial artery (RPTA), left dorsalis pedis (LDP), right posterior tibial artery (LFTA) and left brachial artery (LBA).

BP cuff of different sizes was used to accommodate different patients. The ratio of higher systolic BP between DPA and PTA to of SBP in two brachial arteries and lower of 2 ABI values for legs were used to define a low ABI.

Values were grouped in 5 categories

0.96	Normal
0.81 – 0.95	**Mild**
0.51-0.81	**Moderate**
0.31-0.51	**Moderate - severe**
0.30 or less	**Severe**

The prevalence of PAD was evaluated in subjects using conventional symptomatic criteria and abnormal lower examination and correlated by standard method. Ankle Brachial index is expressed in percentage. Then the data was analysed and grouped according to presence or absence of risk factors in patients with and without clinically diagnosed PAD**.** Statistically the data was grouped and chi square test was applied to find out the prevalence a and then the results of each were calculated.

RESULTS

TABLE 1 : GROUPING OF PATIENTS ACCORDING TO RISK FACTORS

RIK FACTOR	NUMBER	PERCENTAGE
DIABETES	100	50%
HYPERTENSION	100	50%
DM + HTN	60	30%
CAD	40	20%
DYSLIPEDEMIA	60	30%
CVA	4	2%
SMOKER	40	20%

Our of 200 patients included in the study100 were diabetic 100 were hypertensive, 60 patients had dyslipidaemia. 60 had co existing diabetes and hypertension, 40 patients had CAD, 4 had CVA and 40 were smokers.

TABLE 2: AGE WISE GROUPING OF PATIENTS

AGE (YEARS)	**PATIENTS WITH PAD**	**PATIENTS WITHOUT PAD**	**TOTAL**	**PREVALENCE OUT OF 1000**
20-25	0 (0%)	1 (100%)	1	0/1000
25-30	0 (0%)	1 (100%)	1	0/1000
30-35	0 (0%)	2 (100%)	2	0/1000
35-40	0 (0%)	3 (100%)	3	0/1000
40-45	1 (16.68%)	5(83.33%)	6	162/1000
45-50	1 (14.28)	6 (85.71%)	7	142/1000
50-55	9 (20.45%)	35 (79.54%)	44	204/1000
55-60	18 (30%)	42 (70.0%)	60	300/1000
60-65	31 (40.78%)	45 (59.2%)	76	407/1000

In patients with clinically diagnosed PAD only one patient was in age group of 40-45, one was in age group of 45-50, nine patients were in age group of 50-55, eighteen patients in age group of 55-61) and thirty age patients were in age group of 60-65.

Thus showing that the symptomatic PAD increases with increasing age, the risk factors were more in the patients with old age. There was a steep rise in patients with risk factor after the age of 50 years.

Out of total 106 male patients 34 patients had clinically diagnosed PAD and 72 were without clinically diagnosed PAD showing prevalence of 370/1000 in males with risk factors.

TABLE 3: GROUPING OF THE PATIENTS ACCORDING TO SEX WITH AND WITHOUT CLINICALLY DIAGNOSED PAD.

SEX	**NO: OF PATIENTS WITH PAD**	**NO: OF PATIENTS WITHOUT PAD**	**TOTAL**	**PREVALENCE OUT OF 1000**
Female	26 (27.7%)	68 (72.3%)	94	277/1000
Male	34 (32.07%)	72 (69.9%)	106	370/1000
	60	140	200	

Out of total 94 female patients 26 patients had clinically diagnosed PAD and 68 were without clinically diagnosed PAD showing prevalence of 277/1000 in males with risk factors. This showed statistically significant higher male prevalence.

Out of total 60 with clinically diagnosed PAD 24 patients had features suggestive of CAD (40%). Out of total 140 patients without clinically diagnosed, PAD 16 patients had features suggestive of CAD (11.4%).

This clearly shows that features of CAD are more in patients with clinically diagnosed PAD

TABLE 4: GROUPING OF PATIENTS ACCORDING TO EVIDENCE OF CAD

ECG/ ECHO/ STRESS TEST	**NO: OF PATIENTS WITH PAD**	**NO: OF PATIENTS WITHOUT PAD**	**TOTAL**
Features of CAD	24 (40%)	16 (11.4%)	40
Features not of CAD	36 (60%0	124 (88.6%)	160
	60	140	200

TABLE 5 : GROUPING OF PATIENTS ACCORDING TO TRIGLYCERIDE LEVELS

TRIGLYGERIDE LEVEL	**NO: OF PATIENTS WITH PAD**	**NO: OF PATIENTS WITHOUT PAD**	**TOTAL**
>150 mg / dl	20 (33.3%)	20 (14.2%)	40
<150mg/dl	40 (66.6%)	120 (85.7%)	160
	60	140	200

Out of total 610 with clinically diagnosed PAD 20 patients had triglycerides levels greater than 150 mg/dl (33.3%). Out of total 140 patients without clinically diagnosed PAD. 20 Patients had Triglycerides levels greater than 150 mg/dl (14.2%). This clearly showed that prevalence of patients with elevated triglycerides levels were more in patients with clinically diagnosed PAD.

TABLE 6 : GROUPING OF PATIENTS ACCORDING TO TOTAL CHOLESTEROL LEVELS

TOTAL CHOLESTEROL LEVEL	**NO: OF PATIENTS WITH PAD**	**NO: OF PATIENTS WITHOUT PAD**	**TOTAL**
>200 ng/dl	16(26.6%)	28 (20%)	44
<200ng/dl	44(73.4%)	112(80%)	156
	60	140	200

TABLE 7: GROUPING OF PATIENTS ACCORDING TO PRESENCE OR ABSENCE OF CAROTID BRUIT

BRUIT	NO: OF PATIENTS WITH PAD	NO: OF PATIENTS WITHOUT PAD	TOTAL
PRESENT	8 (13.2%)	0	8
ABSENT	52 (86.8 %)	140 (100%)	192
	60	40	

TABLE 8: ACCORDING TO ABI INDEX

ABI INDEX	ABI >0.9	ABI 0.81-0.9	ABI 0.51-0.81	ABI 0.31-0.5	TOTAL
NO: OF PATIENTS WITH PAD	12 (20%)	16 (26.6%)	18 (30%)	14(23.4%)	60
NO: OF PATIENTS WITHOUT PAD	124 (88.57%)	12 (8.5%)	4(2.85%)	0	140
	136	24	22	0	200

TABLE 9: GROUPING OF PATIENTS WITH CLINICALLY DIAGNOSED PAD ACCORDING TO AB INDEX

	NORMAL ABI >0.9	ABNORMAL ABI <0.9	TOTAL
NO: OF PATIENTS WITH PAD	12(20 %)	48(80%)	60

NO: OF PATIENTS WITHOUT PAD	124(88.5%)	16 (11.5%)	140
	136	64	200

Out of 60 with clinical diagnosis of PAD, 16 patients had cholesterol levels greater than 200mg/dl. Out of 140 patients without clinically diagnosed PAD, 28 patients had cholesterol levels greater than 200mg/dl. Though this clearly showed that total cholesterol levels were more in patients with clinically diagnosed PAD than the patients without clinically diagnosed PAD.

Out of total 60 with clinically diagnosed PAD, 8 patients had carotid bruit (13.2%). Out of total 140 patients without clinically diagnosed PAD, no patient had carotid bruit. This clearly showed that carotid bruit was present in patients with clinically diagnosed PAD.

Out of 60 patients with clinically diagnosed PAD,

- 12 (20%) had ABI > 0.9
- 16 (26.6%) had ABI 0.81-0.9
- 18 (30%) had AB 0.51-0.80
- 14 (23.4%) had ABI 0.31 -0.5

Whereas out of 140 patients without clinically diagnosed PAD,

- 124 (88.57%) had ABI > 0.9
- 12 (8.57%) had ABI 0.81-0.9
- 4 (2.88%) had ABI 0.51-0,80
- 0 (0%) Sad ABI 0.31-0.5

  Out of total 60 with clinically diagnosed PAD 18 patients had abnormal ankle brachial index (80.0%). Out of total 140 patients without clinically diagnosed PAD. 16 patients had abnormal ankle brachial index (11.5%). This clearly showed that ankle brachial index is a significant parameter to diagnose PAD.

DISCUSSION: The present study was conducted to study the presence of PAD in the high risk population group and to study the role of Ankle Brachial Index as a diagnostic measure for PAD. Patients in the age group of 20-65 years of age group were taken with the presence of one or more risk factors. Patients and attendants were explained and convinced for participating in the study.

The true prevalence of PAD is greater than expected as majority of the patients are asymptomatic and usually present with ischemic ulcer with or gangrene or for amputation of limb. The prevalence of PAD varies depending on the population studied and the diagnostic method used and whether symptoms are included to derive estimates

PAD is present in 4% of the population greater than 40 years and older and 15-20% in 65 years or greater. In the present study of comprising of 200 patients, 60 patients had clinically evident PAD. Showing the prevalence of 30/100 high risk population.

Data derived from various studies (including Edinburgh Artery Study, Framingham Heart Study and Cardiovascular Health Study) showed 2-3 fold risk of developing PAD in smokers, 2-4 fold risk in diabetic patients. Abnormalities of lipid metabolism also increase in the prevalence of PAD.

Wouter TM, Arme WH et al while conducting the famous Rotterdam study observed that age sex specific presence of PAD in elderly patients aged 50 years and above was 19.1% with DM and 5.5% with hypertension forming major chunk of the patients.

Binaghi et al showed that predominance of hypertension in patients with PAOD is 21.6% is second only in hypercholesterolemia (59.1%). In our study all the patients had either one or more risk factors present.

Two hundred patients with risk factors were studied. The distribution of the risk factors were also varied; 50% of the population was either diabetic of hypertensive 100 patients each 60 patients (30%) had both diabetes and hypertension. 60 patients (30%) were dyslipidaemia, 40 patients

(20%) had evidence of CAD. And 40(20%) patients were smokers and 4(2%)had Cerebro vascular disease.

This showed that most common risk factor was diabetes and hypertension, dyslipidaemias, CAD was next.

In our study the age wise distribution showed a step rise in the patients with risk factors as well as with clinically diagnosed PAD with increasing age showing the prevalence of clinically diagnosed PAD was (300/1000) in 55-60 years and (407/1000) in 60-65 years of age where as low prevalence (166/1000) in 40-45 years and (142/1000) in 45-50 years. This data was consistent with most studies.

Makin A in their study on sex prevalence, 512 patients were studied which comprised of equal male and female with hypertension showed increased prevalence of PAD in males than females. However after menopause the prevalence is same. PAD is more common in males, in females before menopause and after that the prevalence is the same in both.

Kennedy Metal in cardiovascular health study reported a prevalence rate of 12% CAD in patients who had clinically evident PAD which worsened with age. Sarah Het al in Edinburgh artery study showed 17% of men and women having PAD in 55-75 years of age. During follow up about 1/3 died and half of the deaths were due to CAD. Leng GC et al observed (relative risk of CAD was 1.381 in 5 years follow up of PAD patients in the age
group of 55-74 years.

Buyzere CD et al concluded that PAD of lower limbs is associated with high cardiovascular morbidity and mortality. Intermittent claudication is an important predictor of cardiovascular deaths increasing it by three fold and increasing all-cause mortality by fivefold.

In the study 60 patients had clinically diagnosed PAD out of which 24 patients (40%) also had features suggestive of CAD whereas out of 140 patients without clinically evident PAD, 16 patients (11.4%) had CAD. This already showed that PAD patients have more prevalence of CAD

(P) value <0.05 chỉ square -10.3). Anomalies of lipid metabolism are also associated with increased prevalence of PAD.

Elevation in total/LDL cholesterol increased the risk of developing PAD in some studies but not in all. Hypertriglyceridemia independently predicts the risk of PAD. Binaghi et al noted the predominance of hypercholesterolemia was (59.1%) in PAOD and hypertension is (21.6%).

In this study two parameters total cholesterol and triglycerides levels were taken. Fasting samples of all the patients were taken. The patients were grouped in those with elevated (>200mg/dl) total cholesterol and triglycerides (>150mg/dl) levels vs normal levels (<200 mg/dl) total cholesterol an (<150 mg/dl) for triglycerides.

In this study out of 60 patients who had clinically diagnosed PAD 20 patients (33.3%) had elevated triglyceride levels (>150 mg/dl) as compared to 40 patients (66.6%) with levels (<150 mg/dl) whereas 20 patients (14.2%) out of 140 patients without PAD had elevated triglyceride levels (>150 mg/dl),

This showed a significant co-relation between elevated triglycerides level and PAD (p <0.01 chi square-4.51). Apart from these studies all other studies failed to confirm an association between lower extremity arterial disease and elevated total cholesterol levels.

This can he explained by the fact any patient studied was either hypertensive or diabetic and all of them are prone to have dyslipidaemia which is an independent risk factor for PAD. An ABI of 0.9or less is considered abnormal. It is 90-95% sensitive and 95-100% specific for angiographically verified PAD.

ABI is also used to gauge the severity of PAD. Patients with symptoms of intermittent claudication often has ABI ranging from 0.5-0.8 and in patients with critical limb ischemia ABI is (0.5 and less). Newman AB et al evaluated the relationship between ankle brachial index and cardiovascular mortality and morbidity showed ABI 0.9 or less is as important predictor. In this study

measurement of ABI was done in every patient and grading of the patients including to ABI levels were done.

Out of 60 patients with clinically diagnosed PAD

- 12 (88.57%) had ABI >0.9
- 16 (26.6%) had ABI 0.81-0.9
- 18 (30%) had ABI 0.51-0.80
- 14 (23.4%) had ABI 0.31-8.5

Whereas out of 140 patients without clinically diagnosed PAD

- 124 (88.57%) had ABI >0.9
- 12 (8.57%) had ABI 0.81-0.9
- 4 (2.88%) had ABI 0.51-0.80
- 0 (0%) had ABI 0.31-0.5

This clearly showed that ABI levels are an important indicator of severity in patients with PAD. Also out of 60 patients with clinically diagnosed PAD, 12 patients (20%) had normal ABI >0.9, 48 patients (80%) had had abnormal ABI 0.9. But out of 140 patients without clinically diagnosed PAD 124 patients (88.5%) had normal ABI >0.9 and 16 patients (11.5%) had abnormal ABI<0.9. This showed a statistically significance diagnostic value of ABI in detecting PAD. Thus ABI is a simple, non invasive, easy, specific and highly sensitive method of diagnosing peripheral disease and it should be performed regularly in all patients with risk factors.

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