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ASSOCIATION OF RENAL ARTERY STENOSIS WITH CORONARY ARTERY DISEASE IN HYPERTENSIVE PATIENTS: A CROSS SECTIONAL STUDY

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ABSTRACT

Objectives: *To determine the association between Renal artery stenosis (RAS) and coronary artery disease (CAD), and to compare this with normotensive and non CAD patients.*

Materials and Methods: *This was a cross sectional study, conducted at Radiology/Cardiology departments of Mardan Medical Complex (MMC), Mardan. Normotensive patients and hypertensive patients both were included in this study while those patients with known kidney disease were excluded from the study.*

Results: *A total 90 patients were included in study having mean mean age of 45.5 ± 13. RAS-CAD association was evaluated by several parameter in both normotensive and hypertensive patients. The independent t-test among coronary artery disease and renal artery revealed a significant association (p=0.001).*

Conclusion: *The study concluded that progression of Renal Artery Stenosis (RAS) had a strong association with development of coronary artery disease (CAD).*

Key words: *Renal Artery Stenosis, coronary artery disease, hypertensive patients, Doppler*

INTRODUCTION

A narrowing or constriction of the arteries that provide blood to various regions of the body is referred to as arterial stenosis. Atherosclerosis, a buildup of plaque within the artery walls, is the most frequent cause of arterial stenosis. Reduced blood flow and pressure to the afflicted tissues and organs as a result of arterial stenosis can cause a variety of symptoms, such as chest discomfort or angina, shortness of breath, and leg pain or cramps when exercising. A heart attack or stroke may result from artery stenosis in extreme situations, which can be fatal[1].

The underlying cause, location, and degree of vascular stenosis all affect the course of therapy. Treatment options may include taking medications to lower cholesterol and blood pressure, making lifestyle changes including eating a healthy diet and exercising frequently, and, in some circumstances, undergoing surgery or other treatments to remove the blockage or narrowing[2]. Stenosis in coronary artery, aorta, carotid artery, renal artery, peripheral artery, mesenteric artery and pulmonary artery are more prevalent[3–8]

One of the most common cardiovascular disorders impacting people worldwide is coronary artery disease (CAD). It has been established that this illness is the main cause of mortality in both developed and developing 20 nations. Cardiovascular disease development is at risk due to lifestyle, environmental, and hereditary factors. Diabetes mellitus, hypertension, smoking, hyperlipidemia, obesity, homocystinuria, and psychosocial stress are risk factors for coronary artery disease (CAD)[9]. Given that both renal artery stenosis (RAS) and coronary artery disease (CAD)

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can be brought on by atherosclerosis, a buildup of plaque inside the arterial walls, there may be a connection between the two disorders. The coronary and renal arteries, among other arteries throughout the body, can become narrowed or blocked as a result of atherosclerosis. Age, hypertension, diabetes, and smoking are some of the risk factors that are similar between coronary artery disease (CAD) and renal artery stenosis (RAS). Renal artery stenosis (RAS) may be more likely to develop in patients with coronary artery disease (CAD), and vice versa. The same underlying mechanism of atherosclerosis in renal artery stenosis (RAS) patients has been proven in studies to raise the risk of cardiovascular events, such heart attack and stroke[10].

The study was conducted with the aim to determine the association of renal artery stenosis with coronary artery disease in hypertensive patients on Doppler.

MATERIALS AND METHODS

This was cross-sectional study conducted in Radiology/Cardiology departments of Mardan Medical Complex, Mardan (KP). Total of 90 patients were recruited through convenient sampling technique. The sample size was calculated using a formula for two proportions, taking percentages of renal artery stenosis (RAS) in hypertensive and normotensive patients of coronary artery disease (CAD) as 46.2% and 19.5% respectively[11]. Hence, at 5% level of significance, and 80% power, the calculated sample size was 45 in each group i.e. 90 (hypertensive and normotensive patient groups). Normotensive patients with suspected CAD and hypertensive patients with CAD, both gender, and age between 20 to 70 were the inclusion criteria while the exclusion criteria were those patients with chronic kidney disease, single kidney, end stage renal disease and renal transplantation.

Table 1: Baseline characteristics of the patients

Variable		Value
Age (mean ± SD)		45.58 ± 13.02
Gender (n / %)	Male	36 (40)
	Female	54 (60)
Diabetes (n / %)	Yes	21 (23.3)
	No	69 (76.7)
Coronary Artery Disease (n / %)	Yes	45 (50)
	No	45 (50)
Systolic Blood Pressure (n / %)	< 139	44 (48.9)
		46 (51.1)

n: frequency , %: percentage , SD: Standard deviation

RESULT

In this study, a total of 90 patients were included. The age of these patients was 45.58 ± 13.02 with minimum age of 24 years and maximum was 80 years. Among these, 36 (50%) were male, while 54 (60%) were female. Regarding diabetes status, 21 (23.3%) patients had diabetes, while 69 (76.7%) patients did not. Additionally, 45 (50%) participants had a history of coronary artery disease, and an equal number did not. Systolic Blood Pressure distribution shows that 44 (48.9%) patients had a systolic blood pressure less than 139, while 46 (51.1%) patients had a systolic blood pressure of 140 or higher, as shown in Table 01.

Table 02 presents the mean renal artery diameter in relation to gender, systolic blood pressure, diabetes mellitus, and coronary artery disease among the study participants.

The analysis indicates that there was no statistically significant difference in renal artery diameter between male and female participants (P = 0.87). However, participants with systolic blood pressure <139 mmHg exhibited a significantly higher mean renal artery diameter compared to those with ≥140 mmHg (P = 0.001). Regarding diabetes mellitus, no statistically significant difference in mean renal artery diameter was observed between participants with and without diabetes (P = 0.19). Conversely, participants with coronary artery disease demonstrated a significantly lower mean renal artery diameter compared to those without the disease (P = 0.001).

Table 2: Renal Artery Diameter in Relation to Gender, Systolic Blood Pressure, Diabetes Mellitus, and Coronary Artery Disease

Variable		Renal Artery Diameter	P-Value
Gender	Male	6.37 ± 0.15	0.87
	Female	6.29 ± 0.12	
Systolic Blood Pressure	<139	7.02 ± 0.21	0.001
	≥140	5.65 ± 0.79	
Diabetes Mellitus	Yes	5.79 ± 0.92	0.19
	No	6.48 ± 0.83	
Coronary Artery Disease	Yes	5.62 ±0.77	0.001
	No	7.02 ± 0.20	

Table 3: Association of Coronary Artery Disease with Various Factors

		Coronary Artery Disease n (%)		P-Value
		Yes	No	
Age	41-50	01 (2.2)	11 (24.4)	0.006
	51-60	16 (35.5)	10 (22.2)	
	61-70	23 (51.1)	15 (33.3)	
	71-80	05 (11.1)	09 (20)	
Gender	Male	15 (41.7)	21 (58.3)	0.19
	Female	30 (55.6)	24 (44.4)	
Diabetes Mellitus	No	28 (40.6)	41 (59.4)	0.001
	Yes	17 (80.9)	04 (19.1)	
Systolic Blood Pressure	<139	0 (0)	44 (100)	0.001
	≥140	45 (97.8)	01 (2.2)	

n: frequency , %: percentage

The chi-square test results shows a statistically significant difference between the age groups of the patients having positive CAD (p=0.006), where it is more frequent in age group of 61 to70 years, followed by age group 51 to 60, 71 to 80 and 41 to 50 respectively. There was statistically significant relationship between the presence of diabetes mellitus and the occurrence of CAD (p = 0.001). Similarly, systolic blood pressure shows statistically significant association with CAD (p = 0.001). Patients having systolic blood pressure of 140 or higher are more likely to have CAD compared to those with lower blood pressure. On the other hand, the analysis does not shows a statistically significant association between gender and CAD (p = 0.19). These findings highlights the importance of diabetes mellitus and high systolic blood pressure as risk factors for Coronary Artery Disease

DISCUSSION

The demographic distribution, age, type 2 diabetes mellitus and hypertension are the main contributory factors for development of coronary artery disease (CAD) which can be early diagnosed by evaluating Renal artery stenosis (RAS) particularly when associated with hypertension. In this study the higher prevalence of these associated diseases was recorded in 61-70 year of age groups. CDC has reported risk range even from 20 years. But other studies support our findings where they also suggested high risk in these ages. Studies also reported that females are at more risk of developing coronary artery disease (CAD) and hypertension. Our results also showed same trend but no significant difference was found between groups. In KPK may factors contributes to high 70 prevalence of heart disease in females. The major factors included late diagnosis, suboptimal treatment, delayed hospitalization, multiple pregnancies and underlying comorbidities (hypertension, diabetes, obesity). Life modification, awareness and early diagnosis may reduce the disease burden in females[12,13]. Investigating the physiological response to RAS and the impacts of stenosis geometry, measuring the effectiveness of arterial pressure control mechanisms in relation to stenosis severity, predicting future renal artery stenosis (RAS) situations and its association with coronary artery disease (CAD) were the objectives of the current study. Other geometric metrics exhibited minimal influence on hemodynamics, with stenosis % and artery diameter being the primary factors[14]. SBP is easy marker for diagnosing the hypertension and associated changes due to arterial stenosis. Although some other clinical trial established no significant association between RAS and hypertension but our results established[15]. Although studies favored our result by associating renal hypertension (RHTN) with multi organ failure and high risk of cardiovascular diseases[15,16].

CONCLUSION

Renal artery diameter decreases with increase in systolic blood pressure and coronary artery disease patients; however, gender and type 2 diabetes mellitus have no impact on renal artery stenosis. Coronary artery disease is more frequent in 61-70 years age group, and there is significance of diabetes mellitus and high systolic blood pressure as risk factors for CAD.

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