

## HYPERTENSION AND DIABETES IN INDIA: A REVIEW

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### ABSTRACT

*Hypertension (HT) Type 2 diabetes mellitus (DM) are among the most common chronic non-communicable diseases and multifactorial disorders affecting both developed and developing countries, including India. Although DM and HT are not among the top leading causes of death, such as cancer and stroke, these two diseases draw attention from the public due to their increasing trends. The presence of hypertension in diabetic patients substantially increases the risks of coronary heart disease, stroke, nephropathy and retinopathy. When HT coexists with DM, the risk of CVD is increased by 75%, which further contributes to the overall morbidity and mortality of already high risk population. India contributes a lion's share in the diabetic and hypertensive population. This needs to be tackled with proper awareness and proper government policies. The current review article throws light on comorbidity of HT and DM and its current scenario in India.*

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### INTRODUCTION

India, the world's second most populous country, has made an astonishing economic progress in recent years but on the other hand, yet today it finds itself lagging behind peers on healthcare outcomes. Every fifth person in India is diabetic, which made it the world's capital of Diabetics (DM).<sup>(1)</sup> However hypertension (HT) a close associate of diabetes runs parallel or even outstrips it. Hypertension is almost hopping to take hold and may soon upsurge diabetes, statistically in the genetically vulnerable Asian Indian race.<sup>(2)</sup> Although DM and HT are not among the top leading causes of death, such as cancer and stroke, these two diseases draw attention from the public due to their increasing trends, while cancer and stroke are declining.<sup>(3)</sup> This colossal coverage of these two principal disorders, continues to be a major field of investigation with an enormous peer-reviewed literature each year. The present article has been written in view of presenting the enormous information scattered through various literature at glance.

### COEXISTENCE OF DIABETES AND HYPERTENSION

When we consider DM and HT as separate disorders they cover significant world's population under their influence.

DM and HT are the gateway to the cardiovascular diseases and they never hesitate to conquer any community or population. It is projected that the total number of people with diabetes will rise from 171 million in 2000 to 366 million by 2030. The number of adults with hypertension is predicted to increase by 60% to a total of 1.56 billion people by 2025.<sup>(4)</sup>

These two giant disorders often comes hand in hand with each other. Up to 75% of adults with DM also have HT and patients with HT alone often show evidence of insulin resistance. Thus, HT and DM are common, intertwined conditions that share a significant overlap in underlying risk factors (including ethnicity, familial, dyslipidemia and lifestyle determinants) and complications.<sup>(5)</sup>

HT may precede the onset of DM. In about 95% cases, it is essential HT and the rest may be secondary HT. In some cases, both HT and DM may be present at the time of initial diagnosis.<sup>(6)</sup>

### INDIAN SCENARIO

Because of wide diversity in Indian population, the studies conducted till date are limited to the regional population. Though the literature on separate multicentric studies on DM and HT is

available, very few articles are published on coexistence of HT and DM covering maximum population. <sup>(7)</sup>

As per the recent study conducted, to cover maximum population, which recruited a total of 15,662 patients from 807 centers in eight states: Maharashtra, Delhi, Tamil Nadu, West Bengal, Karnataka, Andhra Pradesh, Gujarat, and Madhya Pradesh. The study population had more males (54.8%) than females, and mean age was 48.9–13.9 years. About three-fourths (74.2%) of the patients were 40 years or older and 24.4% (n=3,816) were 60 years and above. <sup>(7)</sup>

Out of 7,212 patients with HT, DM was coincident in 44.7% patients. In a similar calculation, of the 5,427 patients with DM, HT was reported in more than half (59.5%) of the patients. 19.6% patients had previously reported diabetes and were diagnosed as a “new” case of HT, whereas 7.2 % patients with known HT were diagnosed as a “new” cases of DM. <sup>(7)</sup>

The above study does have limitations. It is a clinic-based study conducted in urban metropolitan townships. Although, many of the townships cater to patients from rural and tribal India, this would probably account for <5% of the study population. Despite these shortcomings, the SITE study provides valuable information from a large population representative of India. <sup>(7)</sup>

### **ETIOLOGY OF HT IN DM**

Arterial HT is more common in both type 1 and type 2 diabetes mellitus (DM) than in the general population. <sup>(8)</sup> Traditionally, hypertension in type 1 DM has been attributed to chronic renal failure, whereas in type 2 DM it was thought to reflect concurrence of two common conditions. Recent observations concerning interrelationships among glucose, insulin, body mass, fat metabolism, sodium homeostasis, renal function and the systemic vasculature in blood pressure regulation offer new insights into the mechanisms underlying high blood pressure in DM. <sup>(9)</sup>

Almost all studies evaluating total body exchangeable sodium in diabetic

patients have found increased sodium content, 10% higher than in nondiabetic subjects. <sup>(10,11,12)</sup> The increase in exchangeable sodium is explained partially by active reabsorption of glucose and ketones in the kidney as sodium salts. <sup>(9)</sup>

### **ETIOLOGY OF DM IN HT**

Hypertension is associated with hyperinsulinemia in obese diabetic subjects and nondiabetic obese subjects as well. Furthermore it leads to more insulin resistance. <sup>(13)</sup> In essential hypertension, hyperinsulinemia can occur independent of body weight or glucose intolerance and there is a negative correlation of insulin sensitivity to systolic blood pressure. <sup>(14)</sup> Abnormal tissue response to insulin in association with hypertension can result from specific genetic defects, caloric overload, hormonal manipulations and the presence of obesity as a confounding factor. <sup>(9)</sup>

### **RISKS ASSOCIATED WITH COEXISTENCE OF HT AND DM**

The prevalence of coexistent hypertension and diabetes varies across different ethnic, racial and social groups. Importantly, hypertension in patients with diabetes causes a significant increase in the risk of vascular complications in this population and together both conditions predispose to chronic kidney disease. The overlap between hypertension and diabetes substantially increases the risk of ischemic cerebrovascular disease, retinopathy and sexual dysfunction. DM is an independent risk factor for coronary artery disease and the risk is markedly increased when hypertension is present. There are particular subpopulations in which the coexistence of hypertension and diabetes can pose serious risks. Pregnant women with diabetes and hypertension are at risk for pre-eclampsia. Children with type 1 diabetes and hypertension are particularly vulnerable to end-organ disease. The increase in incidence of childhood type 2 diabetes is worrisome, as cardiovascular risk factors early in life can cause accelerated atherosclerosis with aging. <sup>(4)</sup>

## SCREENING OF DM

Screening tests for DM include risk assessment questionnaires, biochemical tests and combinations of the two. The biochemical tests currently available are blood glucose or urine glucose measurements, blood HbA<sub>1c</sub> or blood fructosamine measurements. Each screening test needs a designated and pre-determined threshold or 'cut-point' that defines high risk. Screening tests are usually followed by diagnostic tests (fasting plasma glucose (FPG) and/or an oral glucose tolerance test (OGTT) using standard criteria) in order to make the diagnosis.<sup>(7,9)</sup>

Measurement of blood pressure is most commonly performed with a sphygmomanometer. HT is usually defined in adults as a systolic blood pressure of 140 mm of Hg or higher, or a diastolic blood pressure of 90 mm Hg or higher. Because of the variability in individual blood pressure measurements, it is recommended that hypertension be diagnosed only after two or more elevated readings are obtained on at least two visits over a period of one to several weeks.<sup>(7,9)</sup>

## STRATEGIES AND INTERVENTIONS TO PREVENT/CONTROL DIABETES AND HYPERTENSION

Within this context of restrained economic conditions, in developing country like India the greatest gains in controlling the DM and HT epidemics lie in their prevention. An integrated approach to the prevention and management, irrespective of cause, is needed in primary health care settings.

Both problems have to be tackled at several levels, that is, primordial, primary, secondary and tertiary prevention. "Primordial prevention" refers to reduction of the risk factors of DM/HT and thereby decreasing the risk of developing DM in the future. "Primary prevention" refers to prevention (or postponement) of the condition in those in a prediabetes/HT stage. "Secondary prevention" refers to prevention of complications in those who have already developed DM/HT. Finally the term "Tertiary prevention" is used to describe limiting physical disability and

preventing progression to end stage complications in those who have already developed some associated complications.<sup>(15)</sup>

**Diet management:** Management of diabetic hypertensives starts with lifestyle changes (weight reduction; regular exercise and moderation of sodium, protein and alcohol), as well as control of hyperglycemia, dyslipidemia and proteinuria apart from management hypertension per se.<sup>(16)</sup>

In the Dietary Approaches to Stop Hypertension trial (DASH), lifestyle modifications such as exercise, a diet low in sodium, saturated fat, cholesterol and high in potassium, calcium, fiber, fruits have clearly been shown to decrease BP.<sup>(17)</sup> The DASH diet recommends keeping salt intake to less than 2300 mg (1500 mg a day – elderly). Excessive sodium intake is particularly deleterious in patients with diabetes because it may decrease the antihypertensive effects of medications and their beneficial effects on proteinuria.<sup>(16)</sup>

But when it comes to control sugar levels in diabetes, dietary management is much more important because almost every food we eat contain sugar. It is recommended to create awareness about food among patients. Making them aware about carbohydrate counting and portion sizes, making every meal well-balanced, coordinating meals and medications and avoiding sugar-sweetened beverages.<sup>(18)</sup>

**Exercise management:** A duration of 20 to 40 minutes of aerobic exercise performed five times a week has significantly lowered BP levels. It is also noted that the results of low to moderate training are just as efficient in lowering BP compared to that with high-intensity cardiovascular exercise. Studies show exercise and weight reduction helps independently in reducing BP, and combining both have additive benefits in diabetic hypertensives.<sup>(16)</sup>

**Drug management:** Clinical trials with diuretics, angiotensin converting enzyme inhibitors (ACEIs), beta blockers, angiotensin II receptor blockers (ARBs) and calcium antagonists have demonstrated benefit in the treatment of diabetic hypertensives. ACEI are the first line in management of diabetic hypertensives.

ACEIs may be used alone for BP lowering but are much more effective when combined with a thiazide-type diuretic or other antihypertensive drug. They reduce the macrovascular and microvascular risks associated with diabetic hypertensives.<sup>(16)</sup> The American Diabetic Association has recommended ACEIs for diabetic patients >55 years of age at high risk for CVD and Beta-blockers for those with known CAD as first-line agents.<sup>(19)</sup>

Hence, while treating diabetic hypertensives, first-line agents used must be an ACEI or ARB (if intolerant to ACEI) or a combination of both or a thiazide diuretic. If the target BP goal is not obtained with the initial doses of first-line drugs, increases in doses are recommended or the addition of a second-line drug must be considered. Regardless of the initial treatment, it must be emphasized that most patients will require more than one drug to achieve the recommended target of  $\leq 130/80$  mmHg. and many will require three or more. Add-on drugs can be calcium channel blockers (preferably dihydropyridine calcium channel blockers [DCCB group], B1 Selective beta-

blockers or alpha-blockers. Achievement of the target BP may be more important than the particular drug regimen used.<sup>(16)</sup>

## SUMMARY

Evidence from clinical practice and from the literature, suggest that approximately half of most common chronic disorders are undetected, that half of those detected are not treated, and that half of those treated are not controlled, this is called 'rule of halves'. With current scenario it can be said that in India the rule-of-halves is not valid and only a quarter to a third of subjects are aware of hypertension & diabetes.

Both hypertension and diabetes should be diagnosed early and treated aggressively to prevent associated microvascular and macrovascular morbidity and mortality. Drug therapy is required in the management of these patients, but lifestyle modification and weight management are key components to reduce glycemia and control blood pressure.

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