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**Case Report**


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## Hypertension, Diabetes and Its Complications: A Case Study



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### ABSTRACT

Hypertension is considered a hemodynamic disorder that is characterized by increased peripheral vascular resistance which might result in some complicated diseases like myocardial infarctions, renal failure and strokes if not diagnosed earlier and treated in good manner. Hypertension is certainly defined as high blood pressure which is generally 140/90 mmHg. Those patients who are suffering from blood pressure might experience symptoms such as dull headaches, vomiting, dizzy spells and much frequent nosebleeds. Treatment for high blood pressure patients might include both treatments such as pharmacological (meditational) and non-pharmacological (lifestyle modifications therapy). Signs & Symptoms, Pharmacotherapy, Complications are studied in a human male subject suffering from hypertension, diabetes & neuropathic pain.



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**Case Discussion:-**

L. K. is 59-year-old man with a history of type 2 diabetes, hypertension, and neuropathic pain. The patient was diagnosed with type 2 diabetes 5 years ago when he presented for mild heart attack.

L.K. is a male, weighing about 69 kg, from the last three years diagnostic diseases are treated like hypertension and diabetes. Initial treatment for diabetes consisted of an oral sulfonylurea with metformin. His diabetes has been under fair control. The constant blood pressure of 160/90 mmHg.

**Designed Questionnaire:-**

- 1) What are the benefits of controlling hypertension in people with diabetes?
- 2) What should be the ideal blood pressure level in patients with hypertension along with diabetes?
- 3) what are the various ways to achieve ideal blood pressure levels along with diabetes?
- 4) What is the pathogenesis of increased cardiovascular risk in type 2 diabetes mellitus?
- 5) What are the cardiovascular Disease Risk Factors Associated with Cardiometabolic Syndrome?

**Commentary:-**

1)Hypertension is certainly systolic and it is strongly and particularly related to stroke in all age groups. The presence of diabetes can result in more than doubles the risk of stroke in patients with hypertension lowering the Blood Pressure in patients with hypertension can beneficially result in diabetes by reducing the risk of stroke by 44%.

Hypertension is considered a powerful risk factor for cardiovascular morbidity as well as mortality, critically in patients with diabetes. Patients with hypertension can be at two to three times higher risk of developing diabetes considering than patients with normal blood pressure (BP). Patients suffering from type 2 diabetes have a two- to fourfold greater risk of death from cardiovascular causes than those without diabetes. (1)

2)The present body of proof suggests that the patients with type 2 diabetes mellitus or impaired fasting glucose or impaired glucose tolerance, a systolic Blood Pressure treatment

goal should be 130 to 135 mm Hg then only it will be considered to be acceptable. However, with more aggressive targets (<130 mm Hg), reports have observed target organ heterogeneity resulting that the risk of stroke has been continued to fall but there were no beneficial results regarding the risk of other macrovascular or microvascular such as cardiac, renal and retinal events and the risk of serious adverse events even increased (2).

3) There are three ways to achieve a good blood pressure level so as to maintain good blood glucose levels.

a) Non-pharmacological therapy

b) Pharmacological/drug therapy

c) Combination therapy

a) Nonpharmacologic therapy includes things such as weight loss, low-sodium diet i.e. low salt food and regular exercise which can results in beneficial effects in patients with hypertension, those with diabetes, and also can be effective in those who have both these disorders.

Moreover, increasing the consumption of fresh fruits and vegetables (8–10 servings/day) and lowering daily fat dairy products (2–3 servings/day); and the most important aspect is avoiding excessive alcohol consumption and increasing physical activity and exercise levels.

b) It contains Blockers of the renin–angiotensin–aldosterone system (RAAS). Blockers of RAAS can either be angiotensin-converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARBs) moreover have become the cornerstone of the management of patients with hypertension along with diabetes. In high-risk patients with diabetes, ACE inhibitors can result in reduced CV-related morbidity and mortality.

Thiazide diuretics have always been, are, and will be a major component of the antihypertensive drug arsenal. In the classification of Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT), chlorthalidone has been shown to be superior to the  $\alpha$ -blocker doxazosin mesylate in preventing stroke and to the ACE inhibitor lisinopril has been effective in preventing stroke in patients.

c) As per studies earlier in this paper, it is very difficult to achieve Blood Pressure targets with monotherapy and most patients require a combination of two or three drugs to get to the

target. Therefore, the main question should be which combination is preferable. A blocker of the RAAS, either an ACE inhibitor or an ARB, represents the cornerstone of the antihypertensive arsenal for patients with diabetes plus hypertension.

In combination therapy, drug therapy is provided along with non-drug therapy which is physical activity and exercises.

4) The moderate presence of hypertension in individuals/patients with diabetes mellitus can be a strong determinant of atherosclerotic disease, endothelial inflammation and vascular damage. Statistical data shows that almost 40% of individuals with type 2 diabetes mellitus are already hypertensive at the time of diagnosis, this situation can be very often accompanied by obesity and at a higher risk of developing cardiovascular disease. In contrast, many of patients with Type 1 diabetes mellitus (T1DM) may not have hypertension when diagnosed with diabetes mellitus. The development of essential hypertension and complications from always heads to organ damage, in particular nephropathy is considered to be the most responsible for the increase in prevalence with prolonged duration of diabetes mellitus. With all the considerations, the coexistence of both diabetes mellitus and hypertension can in combination multiply the risk of the development as well as the progression of nephropathy while concurrently instigating endothelial damage and it can be the reason for elevating the risk of adverse cardiovascular outcomes through various mechanisms (3).

5) Further it is observed that diabetes & hypertension result in Hypertension, central obesity, Hyperinsulinemia/insulin resistance, Endothelial dysfunction, Microalbuminuria.

i. Effects on lipid parameters seen are high low density lipoprotein cholesterol levels, High triglyceride levels, small, dense low-density lipoprotein cholesterol particles, increased apolipoprotein B levels.

ii. Effects on hematological parameters seen are increased fibrinogen levels, increased plasminogen activator inhibitor 1 and decreased plasminogen activator levels, increased C-reactive protein level and other inflammatory markers. These proteins are considered as one of most prone elements which can cause many disorders.

iii. Salt sensitivity. It is considered one of the most adverse effects of hypertension.

iv. Left ventricular hypertrophy (4)

The following medicines are prescribed to patient with Hypertension and Diabetes during Checkups :-

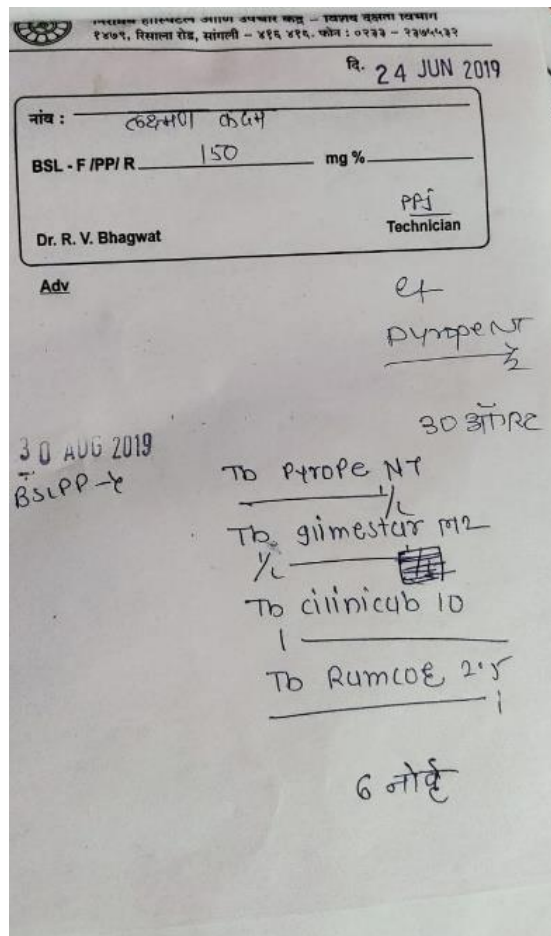
Patient Name:- LK

Diagnosed Diseases:- Hypertension , Diabetes.

Date:- 30 August 2019 BSL:-150 PP:-90 Drugs:-

Prescribed Drug : Pyrope NT, Glimestar M2, Cilnicab10mg, Ramicure 2.5 mg.

Following report of patient prescribed by the authorised physician.



**1<sup>st</sup> report 24<sup>th</sup> June 2019**

❖ Same dosage of drugs is continued henceforth for further treatment of Mr Laxman Kadam

📅 **Next Date** :- 19 November 2019

**BSL/ PP** :-200 mg%

✚ Next Date :-20 January 2020

BSL/ PP :- 170mg%

✚ Next Date:- 16 September 2020

BSL/ PP :- 110mg%

Blood pressure:- 160/90 mm Hg

❖ Those drugs are continued until now.

✚ Next Date :-15 Oct 2022

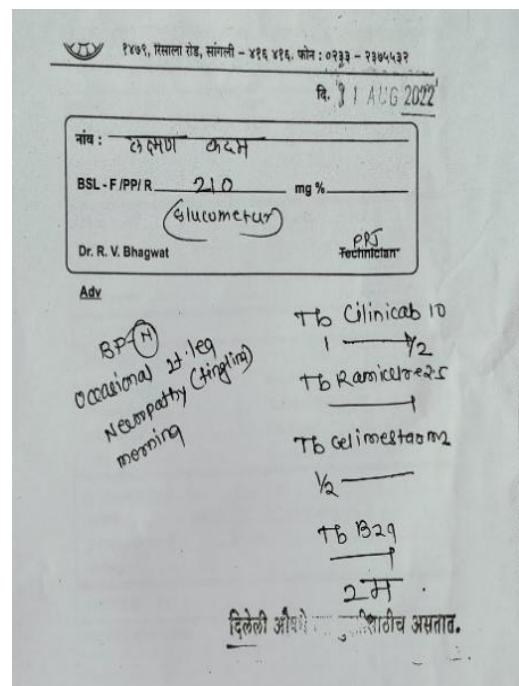
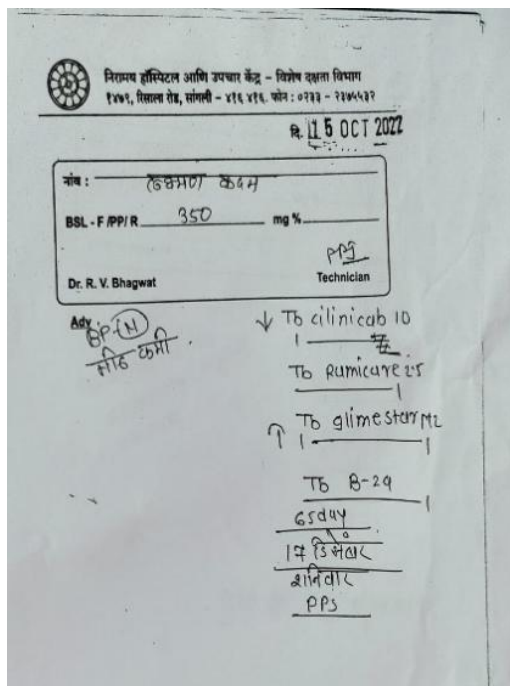
Blood sugar level (bsl) -350

Blood pressure - normal

Advice- minimum amount of salt added should be in diet

Prescribed Drug-

1]Tb Clinicab 10 2] Tb Rumicure 2.5 3] Tb Glimestar M 2 4] Tb B-29



Report on 15 Oct 2022

Report on 1 Aug 2022

📅 **Next Date:**-1 August 2022

**Blood sugar level** - 210(glucometer)

**Blood pressure**- Normal

**Occasional** - Left Leg Neuropathy (tingling) morning

Hb gm % -13.0

S creatinine mg% -0. 98

**1)Pyrope NT:-**

**Content :-**

○ **Pregabalin**

•**Mechanism of action** (<sup>5-7</sup>)

Drug→ binds to alpha-2-delta subunit of voltage-gated calcium channels in CNS → Increases GABA levels → produces anti-convulsive effects

Does not affect sodium channels

The drug interacts with descending noradrenergic & 5-HT pathways (originating from brainstem)→ reduces neuropathic pain and controls hypertension.

○ **Nortriptyline:-**

• **Mechanism of action:** (inhibition of amine pump)

• TCA inhibits neuronal reuptake of both 5-HT & NA leading to accumulation of NA & 5-HT in the brain tissue.

• It has been suggested that improvement of the emotional symptoms is related to the enhancement of 5-HT transmission while improvement of biological symptoms is related to enhancement of NA transmission.

• Elevation of mood in depressed patients occurs after 2-3 weeks and helps to control hypertension.

## 2) Glimestar M2:

### Content

○ **Glimepiride** -Second-generation sulfonylurea, more specific to the pancreas than other tissues, especially the myocardium.

• **Mechanism of action** - Glimepiride works by stimulating the secretion of insulin granules from pancreatic islet beta cells by blocking ATP-sensitive potassium channels (KATP channels) and causing depolarization of the beta cells.

○ **Metformin:**

• **Mechanism of action-** inhibition of the mitochondrial respiratory chain (complex I), activation of AMP-activated protein kinase (AMPK), inhibition of glucagon-induced elevation of cyclic adenosine monophosphate (CAMP) with reduced activation of protein kinase A (PKA), inhibition of phosphate dehydrogenase, and an effect on gut microbiota.

**3] Cilnicab10mg-** Cilnicab 10mg Tablet is a medicine used to treat high blood pressure (hypertension). It belongs to a class of medicines known as a calcium channel blocker which helps to lower blood pressure. This helps prevent heart attacks and strokes. It may also be prescribed to prevent angina (heart-related chest pain).

**Clinidipine MOA-**Cilnidipine acts on the L-type calcium channels of blood vessels by blocking the incoming calcium and suppressing the contraction of blood vessels, thereby reducing blood pressure.

**4) Ramicure 2.5-**Ramicure 2.5mg Tablet is widely used to treat high blood pressure and heart failure and may even be prescribed after a heart attack. It also lowers the chances of having a heart attack or stroke.

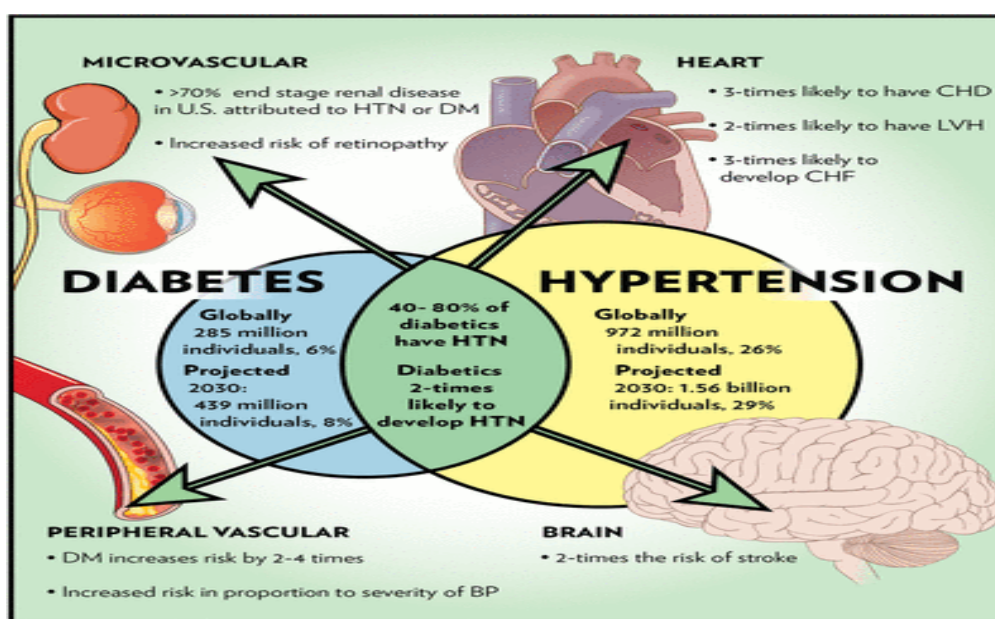
**Ramipril -MOA-** Ramipril inhibits angiotensin-converting enzyme and decreases angiotensin II formation. ACE inhibitors inhibit the actions of angiotensin converting enzyme (ACE), thereby lowering the production of angiotensin II and decreasing the breakdown of bradykinin. The decrease in angiotensin II results in the relaxation of arteriole smooth muscle leading to a decrease in total peripheral resistance, reducing blood pressure as the blood is pumped through widened vessels.



5) **B-29** - Vitamin B9 / Folic Acid / Folate (1.5 Mg) + Alpha Lipoic Acid (100.0 Mg) + Vitamin B6 / Pyridoxine (3.0 Mg) + Vitamin B12 / Mecobalamin / Cyanocobalamin / Methyl cobalamin (1500.0 Mcg) + Vitamin D3 / Cholecalciferol (1000.0 IU)

•**Mechanism of action** –

Vitamin B12 serves as a cofactor for methionine synthase and L-methyl malonyl-CoA mutase enzymes. Methionine synthase is essential for the synthesis of purines and pyrimidines that form DNA. L-methyl malonyl-CoA mutase converts L-methyl malonyl-CoA to succinyl-CoA in the degradation of propionate 24, an important reaction required for both fat and protein metabolism. It is a lack of vitamin B12 cofactor in the above reaction and the resulting accumulation of methyl malonyl CoA that is believed to be responsible for the neurological manifestations of B12 deficiency 10. Succinyl-CoA is also necessary for the synthesis of hemoglobin. (4,5)



**Fig.1. Diabetes and Hypertension and Related Disorders.**

**CONCLUSION:-**

This above case report represents an association between type II diabetes mellitus in patients with the co-morbidity of Hypertension including diabetic neuropathy. This case consists of an association between the levels of plasma glucose concentrations with previous cardiac complications and the blood pressure of non-diabetic individuals. The management of this kind of patient requires adequate drug therapy but in this case the treatment was rational and

had no dosing issues. Certainly, the continuous and observant treatment for this patient resulted in the controlled diabetes mellitus and its complications along with controlled hypertension.

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**CONFLICT OF INTERESTS:** Declared none

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