



Review on Coexistence of Hypertension with Diabetes Mellitus

Nargis Saharan^{a*}

^a *University of Sindh, Pakistan.*

Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/JPRI/2021/v33i50A33398

Editor(s):

(1) Dr. Jongwha Chang, University of Texas, College of Pharmacy, USA.

Reviewers:

(1) Soesmeyka Savitri, Diponegoro Univesity Semarang, Indonesia.

(2) Elizabeth Guzman Hernandez, Universidad Nacional Autonoma de Mexico, Mexico.

Complete Peer review History: <https://www.sdiarticle4.com/review-history/76440>

Review Article

Received 30 August 2021

Accepted 01 November 2021

Published 16 November 2021

ABSTRACT

The coexistence of both diabetes mellitus and hypertension affect the some major target organs. Their common target organ is heart and kidney. The primary goal in the management of the hypertensive diabetic patients is lowering blood pressure to less than 130/80mm Hg Beta- blockers have been reported to adversely affect the overall risk factor profile in the diabetic patient. Initially ACE inhibitors and ARB are initially can be given to diabetic hypertensive. Beta blockers also show great effects in preventing further cardiovascular diseases in diabetic hypertensive. Although combined drug therapy is usually required to achieve goal but in addition to drug therapy some other precautions should also plays effective role like exercise ↓low sodium chloride intake, lower lipids in diet, maintaining glucose level, stress less patients environment. Calcium channels blockers and diuretics in combination with ACE inhibitors and antidiabetic drugs will also exerts beneficial effects.

Keywords: *Diabetes mellitus; hypertensive; heart; kidney; beta blockers; ARB; ACE inhibitors; diuretics; calcium channel blockers.*

*Corresponding author: E-mail: nargissaharan@yahoo.com;

1. INTRODUCTION

Hypertension elevated Blood pressure and diabetes elevated blood glucose level both frequently coexists. By occurring individually they both lead to several cardiac diseases but when they coexist may increase the risk for cardiovascular and renal diseases [1,2]. Diabetes and hypertension coexist in approximately 40 to 60% of patients with type 2 diabetes. Diabetic subjects have a 1.5 – 3 times increased prevalence of hypertension compared to non-diabetics Hypertension itself is a strong threat for other cardiovascular disease such as stroke, myocardial infarction, angina, peripheral arterial diseases [3]. The coexistence of hypertension and diabetes is due to a reason Epidemiology that Patients with Type2 Diabete Mellitus have metabolic derangements termed the cardio metabolic or cardio renal metabolic syndrome [4,5]. This syndrome comprises a many of CVD risk factors including hypertension, dyslipidemia, central obesity, and chronic kidney disease. The coexistence of hypertension and diabetes increases the risk for cardiovascular disease (CVD), cerebrovascular accident (CVA), retinopathy, and nephropathy Hypertension during diabetes can increase progression of microvascular and macrovascular complications.

2. EPIDEMIOLOGY

In Between 1976 -1987, the occurrence of diabetes, arise from 11.4 to 14.3% in the USA It is estimated that globally, the number of people with diabetes will rise from 151 million in the year 2000 to 221 million by the year 2010 and to 300 million by 2025!more than 5% of the world population. (According to WHO) [6]. Rising of Diabetic patients in the United States and all over the globe, thereby becoming an increasingly powerful threat to global health.

3. RISK FACTORS

Hypertension and diabetes have almost similar risk factors, which includes obesity, which is most common cause because in obesity the extra fat can cause release of different mediators which results in sensitivity to insulin and constriction of blood vessels ,lipid profile ,stress which results in more release of epinephrine which results in increase in blood pressure and release of glucocorticoids which results in more gluconeogenesis and results in increase blood pressure and blood glucose level genetic factors also contribute for both of these conditions in

addition with all of these environmental factors also plays role in development of diabetes and hypertension moreover, as both are factors of metabolic syndrome, they commonly occur together in individuals [7]. Some studies indicated that high BP is a significant predictor of type 2 Diabetes [8,9].

4. CLINICAL RESEARCHES

- 1) A research was done at Diabetes Clinic and Medical Wards of the University College Hospital, Ibadan, between June-July, 2009. In which 124 patients with co-existent diabetes and hypertension were consecutively recruited into the study. Among 124, 83 were females and 41 males Their clinical history was carried by a semi- structured questionnaire, f. Records of fasting plasma glucose, urinalysis and electrolytes, urea and creatinine were obtained. Among these 124 sixty (49.6%) patients was Hypertensive diabetics while 52 (43%) were diabetic Hypertensives.
- 2) According to another research which was conducted in Nahr and Nil State (River Nile State) in Sudan between May and August 2018 to identify the prevalence of hypertension and risk factors among patients with DM in that region. In which 1973 patient was involved of age 50-65 year.

In the results 47.6% of patients are found to have Hypertension with diabetes.

5. PATHOPHYSIOLOGY OF HYPERTENSION IN DIABETES MELLITUS

Hypertension occurs because of increased body fluid. Patients with diabetes mellitus experience increased peripheral artery resistance due to vascular remodeling and increased body fluid volume associated with insulin resistance-induced hyperinsulinemia and hyperglycemia. Other factors include maladaptive changes in the autonomic nervous system, vascular endothelial dysfunction, enhanced activation of the renin-angiotensin- aldosterone system, immune function alterations, and harmful environmental factors. In diabetes there is higher risk of increase production of thromboxane A2, which is produced by platelets and cause vasoconstriction [10,11]. In diabetes there is low concentration of Nitric Oxide which act as vasodilator In first 2

weeks of diabetes, Nitric Oxide is blocked by the products of glycosylation. In this way glycosylated hemoglobin reduces the endothelium dependent relaxation mediated by Nitric Oxide.

The activation of the renin-angiotensin-aldosterone system also plays an important role in endothelial dysfunction. Levels angiotensin II & bradykinin inside the endothelial wall are controlled by the angiotensin-converting-enzyme (ACE).

ACE breaks down bradykinin to produce angiotensin II. Bradykinin stimulates the endothelial cell to release vasodilating substances. The action of kinase is maintained in spite of endothelial dysfunction except in very severe arterial injuries. Angiotensin II could be partly responsible for endothelial dysfunction because it induces resistance to the vasodilatory effect of the Nitric Oxide.

6. TREATMENT

In addition with antidiabetic medicines to control blood glucose levels Angiotensin- converting enzymes Inhibitors (ACE inhibitors) and angiotensin receptor blockers (ARB) are considered as 1st line therapy to treat Hypertension in diabetic patients, but they can't be given together. The Target goal is to maintain BP is 130/80mmhg,if the goal is not achieved with these class of anti hypertensives then beta blockers, and diuretics are given as 2nd line of therapy [9]. Calcium channel blockers are used in very last when Hypertension is refractory and cannot be maintain with other drugs. Multiple drug therapy should also give to maintain target blood pressure.

7. GUIDELINES AND RECOMMENDATIONS

- The target BP during Diabetes should be 130/80 mmhg [5].
- Daily monitoring of Blood pressure and glucose level.
- Low lipid diet and low sodium intake [6,8].
- Low glucose in diet.
- Multiple medicines should be used to maintain targeted Blood pressure [12].
- Avoiding excessive alcohol and engaging in stress free activities.

Avoid smoking and doing regular exercise.

8. CONCLUSION

Mostly patients who are suffering from hyperglycemia are very likely to be more prone to have developed with hypertension. Diabetes and hypertension both disease alone itself causes the high risk of morbidity and mortality [13]. HTN affects the majority of individuals with diabetes mellitus. A combination therapy of drugs can frequently required to control blood pressure with other precaution and life style modification and may be more beneficial in patients with hypertension and diabetes mellitus.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Hamer Owaid Alanazi Yusef Muhana Alenezi. Coexistence of Hypertension and Diabetes Mellitus in Elderly Population of Arar City, Northern Saudi Arabia. 2017;69(8):30,3154-3159.
2. Tedesco MA. Effects of coexisting hypertension and type II diabetes mellitus on arterial stiffness, Journal of Human Hypertension. 2004;18:469-473.
3. Karen L Whalen. Pharmacologic Management of Hypertension in Patients with Diabetes. 2008;78(11):1277-1282.
4. Sowjanya Naha, Michael J. Hypertension in Diabetes; 2021. Available:<https://www.ncbi.nlm.nih.gov/books/NBK279027/>
5. Ian H, de Boer, Sripal Bangalore. Diabetes and Hypertension: A Position Statement by the American Diabetes Association. Diabetes Care. 2017;40(9):1273-1284. Available:<https://care.diabetesjournals.org/content/40/9/1273>
6. Vasilis Tsimihodimos, Clicerio Gonzalez-Villalpando, James B Meigs, Ele Ferrannini, Hypertension and Diabetes. 2018;71 Available:<https://www.ahajournals.org/doi/1>

- 0.1161/HYPERTENSIONAHA.117.10546
7. Apurba Talukdar, Biplab Kumar Dey. Coexistence of Diabetes Mellitus and Hypertension -A Review. 2017;7(2). ISSN: 2249-3387
 8. Daniela Bassi Ramona Cabiddu ,Effects of Coexistence Hypertension and Type II Diabetes on Heart Rate Variability and Cardiorespiratory Fitness. Available: <https://www.scielo.br/ij/abc/a/bLqSgvZbBRsWndG83VFsHjN/?lang=e> Available: <https://doi.org/10.5935/abc.20180105>
 9. Omer Abdelbagi, Imad R Musa, Shaza M Musa. Prevalence and associated factors of hypertension among adults with diabetes mellitus in northern Sudan: A cross-sectional study. 2021; Article number: 168.
 10. E Grossman, High blood pressure and diabetes mellitus: Are all antihypertensive drugs created Equal. 2000;160(16):2447-52.
 11. Apurba Talukdar, Coexistence of Diabetes Mellitus and Hypertension -A Review; 2017. Available: <https://www.researchgate.net/publication/340297156>
 12. Ahmet Afşin Oktay, Diabetes mellitus and hypertension: A dual threat. 2016;31(4): 402-9.
 13. Janka HU. Hypertension and diabetes mellitus.1993;48(3):157-61.

© 2021 Saharan; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<https://www.sdiarticle4.com/review-history/76440>