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Effect of Anti-Hypertensive medications on Haemoglobin level in Hypertensive patients

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Abstract

Aim: To assess the effect of anti-hypertensive medications on haemoglobin and haematocrit level in hypertensive patients. **Methods:** Prospective observational study for duration of 6 months was carried out. **Results**: Among all the drugs, beta blockers showed appreciable reduction in both SBP (13.29%) and DBP (9.64%). Comparatively, ACEI showed greatest impact on haemoglobin (35%) and haematocrit (7.77%) level followed by ARB. Beta blockers showed least reduction of haemoglobin (5.43%) and haematocrit (2.37%) level. **Conclusion**: Beta blockers showed greater reduction of BP and had least impact on haemoglobin and haematocrit level.

Key Words: Anti-hypertensive Medications, Blood Pressure, Haemoglobin, Haematocrit.

INTRODUCTION

Cardiovascular disease is one of the major causes of death worldwide. Hypertension is a major risk factor for cardiovascular disease [1] and it is one of the important public health problems worldwide. It is the most common cardiovascular disease and a major cardiovascular risk factor that causes significant morbidity and mortality worldwide [2]. Use of anti-hypertensive medications can be associated with a reduction in haemoglobin concentration. The magnitude of such an amendment is generally small, but in some instances, it can be extremely enough to produce a clinically significant degree of anaemia. The basic mechanism for anti-hypertensive medication-induced changes in Hb concentration includes haemodilution, haemolytic anaemia and suppression of red blood cell production [3]. Use of ACEIs decreases the circulating angiotensin levels with subsequent inhibition of erythroid precursors which in turn reduce the insulin growth factor level that is associated with erythroid stimulation [4].

EPO causes calcium influx into the erythroblasts through voltage independent calcium channels and nifedipine is known to be a voltage dependent calcium channel blocker. But nifedipine impeded the calcium influx to erythroblasts and blocked the EPO activity invitro [5].

Diuretics reduce renal EPO production [6] via the inhibition of tubular sodium reabsorption which reduces renal oxygen consumption and increases renal oxygen pressure [7] causing decreased EPO production. Beta blockers also adversely affect the production of erythropoietin but only to a lesser extent. The mechanisms involved in Hb level reductions related to ARBs are well known; erythropoiesis is inhibited as a result of a decrease in the peptide hormone angiotensin II (Ang II), which stimulates EPO secretion and acts as a growth factor for erythropoiesis in the bone marrow [8]. Thus, the study was aimed to assess the effect of anti-hypertensive medications on haemoglobin and haematocrit level in hypertensive patients.

MATERIALS AND METHODS

A Prospective observational study (IEC approval Ref.No.: SVCP/IEC/JAN/2019/05) was carried out in 236 patients having newly diagnosed hypertension out of which 148 were selected who are prescribed with either of the following anti-hypertensive classes: ACEI, ARB, β- Blockers, CCB or Diuretics. Consent was obtained from each subject in patient consent form before initiating the study. Structured pro-forma was used to collect various clinical and demographic details of the patients such as age, gender, reason for admission, past medical history, past medication history, vital signs, lab investigations, primary diagnosis and treatment chart. Treatment data including prescribed drugs, doses, frequency and route of administration were also recorded.

STATISTICAL ANALYSIS

The statistical analysis was done using Microsoft Excel and Graphpad version 3.10. Collected data were entered in Microsoft excel spreadsheet for further interpretations. Analysis was done using Student T-Test.

RESULTS

Out of 236 hypertensive patients, 148 patients were selected as per inclusion and exclusion criteria. Their demographic and treatment details were collected.

Mean Bp Reduction

Greatest reduction in both SBP and DBP was observed in patients treated with Beta Blockers followed by CCB while diuretics showed least reduction in BP.

Table-1: Mean BP reduction

Drug class	Percentage reduction in SBP (%)	Percentage reduction in DBP (%)
ACEI	8.242	6.804
ARB	7.422	4.276
BETA BLOCKER	13.289	9.644
CCB	10.899	8.274
DIURETICS	5.884	2.057

Percentage Reduction of Hb

ACEI drugs were found to cause maximum reduction in Hb level followed by ARB. And Beta blockers had least impact on Hb.

Table-2: Mean Percentage Reduction of Hb

Sl No.	Drug class	Mean percentage reduction of Hb (%)
1	ACEI	35
2	ARB	22.51
3	BETA BLOCKERS	5.43
4	CCB	9.87
5	DIURETICS	19.64

EFFECT OF SPECIFIC DRUGS

Among the commonly prescribed ACEIs, Captopril had greater mean reduction and Ramipril showed the least mean reduction in Hb level.

Table-3: Effect of ACEI on Hb

Generic name	No. of patients (n=33)	Percentageof patients (%)	Percentage reduction (%)
Captopril	14	42.42	42.75
Enalapril	5	15.15	33.74
Ramipril	14	42.42	27.71

Among the ARBs prescribed, Olmesartan had more impact on Hb level and Losartan was comparatively having less impact.

Table-4: Effect of ARB on Hb

Generic name	No. of patients (n=29)	Percentage of patients (%)	Percentage reduction (%)
Losartan	15	51.72	20.43
Olmesartan	3	10.34	26.22
Telmisartan	14	48.28	23.51

Propanolol caused greater reduction of Hb level and Nebivolol caused the least Hb reduction among the Beta Blockers.

Table-5: Effect of Beta Blockers on Hb

Generic name	No. of patients (n=28)	Percentage of patients (%)	Percentage reduction (%)
Atenolol	5	17.86	7.49
Metoprolol	17	60.71	4.93
Nebivolol	3	10.71	2.17
Propanolol	3	10.71	8.13

Among the patients prescribed with CCB, Nifedipine had greatest impact on Hb and Cilnidipine had the least impact.

Table-6: Effect of CCB on Hb

Generic name	No. of patients (n=30)	Percentage of patients (%)	Percentage reduction (%)
Amlodipine	11	36.67	9.15
Cilnidipine	13	43.33	8.98
Nifedipine	6	20	13.09

Among the two Diuretics prescribed, Hydrochlorothiazide caused greater reduction of Hb and Spironolactone caused less reduction comparatively.

Table-7: Effect of Diuretics on Hb

Generic name	No. of patients (n=28)	Percentage of patients (%)	Percentage reduction (%)
Hydrochlorothiazide	15	53.57	20.27
Spironolactone	13	46.43	18.91

Percentage Reduction of Haematocrit

Beta blockers were found to be the class which causes least percentage reduction of Hct and ACEI causes highest reduction.

Sl no.	Drug class	Mean percentage reduction of Hct (%)
1	ACEI	7.77
2	ARB	6.51
3	Beta blockers	2.37
4	CCB	4.42
5	Diuretics	5.66

DISCUSSION

Hypertension is a leading risk factor affecting morbidity and mortality worldwide. It is considered to be the third major cause of disease burden, globally [9]. It is a chronic disorder, so long term intake of medicine is necessary to control elevated blood pressure. Long term usage of drugs may have adverse impacts on patient's health and quality of life. The use of anti-hypertensive medications was found to alter various haematological parameters. This study tried to find out the effect of anti-hypertensive therapy specifically on haemoglobin level.

In BP reduction, it is observed that Beta blockers results in greatest reduction of both SBP and DBP and Diuretics, the least reduction.

In this study we evaluated the effects of anti-hypertensive medications on the haemoglobin level. ACE inhibitors, ARBs, β-blockers, CCBs and Diuretics are found to have an influence on Hb level. This effect on the haemoglobin level was found to be statistically significant. More precisely, ACE inhibitors are having the greatest impact on Hb level. This finding is in accordance with the study conducted by Ajmal A *et al.,* [10].

In our study, we also compared the effect of anti-hypertensive medications on haematocrit level and found a greater reduction with ACEI therapy followed by ARBs and Diuretics.

Compared to all anti-hypertensive drugs, ACE inhibitors reduced the haemoglobin and haematocrit level to a maximum in our study population. This result is supported by the studies conducted by Leshem-Rubinow E *et al.,*[11] Ishani A *et al.,*[12] Ajmal A *et al.,* [10] and Terrovitis JV *et al.,*[13].

CONCLUSION

Among the prescribed drug classes, beta blockers have greatly lowered both SBP and DBP while diuretics showed the least reduction in SBP and DBP. The incidence of hypertension was more common in male patients who were in the age group of 56-65 years. Compared to all anti-hypertensive drugs, ACE inhibitors had reduced the hemoglobin and hematocrit level in hypertensive patients. Beta blockers produced a greater reduction in BP and had least impact on hemoglobin and hematocrit level. So, the pharmacist should actively participate and intervene to recommend the physicians in prescribing Beta blockers for hypertension. Further studies may be carried out with other classes of drugs.

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