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Study of Treatment Categories On The Basis Of Serum Vitamin D3 Levels in Essential Hypertension

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Abstract: *One of the most important causes of premature death is Hypertension across the world rated by WHO. A systematic analysis conducted by the Global and Regional Burden of Disease and Risk Factors study (2001) has rated hypertension as the second most important cause in south Asia for attributable deaths and attributable disease burden. Vitamin D3 has an association with hypertension which is proven by many studies. Hence while providing the treatment for hypertension, the concerned medical practitioners should observe vitamin D3 levels as well. The present work studied the treatment categories in essential hypertension on the basis of serum vitamin D3 levels. The study concluded that for patients having severe vitamin D3 level deficiency, triple drug therapy should be given for better results and such patients who have sufficient level of vitamin D3, they may be treated with single drug therapy. This means that higher low value of vitamin D3 higher the level of treatment.*

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I. Introduction

Blood pressure (primary hypertension) means high level of blood pressure caused by the force of blood against the arterial walls due to the pumping action of the heart in the body. This force of blood caused by the pumping action when crosses the normal limits hypertension occurs.[1]

Statistics have also shown that in India Hypertension is very much responsible for many severe ailments which have resulted into death like 24% of all coronary heart disease deaths and 57%of all stroke deaths. Many studies have shown that the level of Hypertension among urban adults is much higher as compared to rural adults and numbers of male adults and female adults also varied among various populations in different cities like in Mumbai men 44% and women 45%. These figures were found in 1999 and similarly in Jaipur men 30%, women 33% and these figures were found in the year 1995. The numbers in rural population are much lower as compared to the numbers found in urban population i.e. men 24%, Women 17% in Rajasthan (1994) and in Mumbai in 2000 27% male and 28%female. 25% urban and 10% rural population in India is suffering from Hypertension is shown by epidemiological studies' pooling. The statistics have shown that around the world more than one billion people approx. are suffering from arterial hypertension.[2]

One of the most important causes of premature death is Hypertension across the world rated by WHO. A systematic analysis conducted by the Global and Regional Burden of Disease and Risk Factors study (2001) has rated hypertension as the second most important cause in south Asia for attributable deaths and attributable disease burden.[3]

The relationship between rickets and less exposure to sunlight was noted and observed by many almost two hundred years ago. In 1922 in clinical practice ricket's treatment with the help of exposure to the UV light was introduced. Almost nine years later Vitamin D was discovered i.e. ergocalciferol and 7-dehydrocholestrcol was discovered five years later. During the 1960s, 1,25 dihydroxycholecalciferol, 25-hydroxyvitamin D, and vitamin D receptors were discovered.[4]

Deficiency of Vitamin D is a highly prevalent condition, it is present in approximately 50% of the population. The renin-angiotensin-aldosterone system is activated by vitamin D deficiency and it may also cause hypertension and ventricular hypertrophy. Vitamin D plays crucial role in maintaining normal metabolism of the body. Vitamin D is a vitamin like any other vitamin because of its exogenous source but it is also a fact that vitamin D is a hormone as well.[5]

Objectives

To study the treatment categories in essential hypertension on the basis of serum vitamin D3 levels.

Methods

The study is conducted at the MGM Institute of Health Sciences, Navi Mumbai. Total 100 patients were selected for the study from OPD and also the admitted ones in the Medicine ward of the Institute after fulfilling the inclusion and exclusion criteria.

Information was collected through a pre-tested and structured Proforma for each patient. Qualifying patients underwent thorough detailed history, clinical examination and laboratory investigations.

Inclusion Criteria:

1. Patients with Essential Hypertension.
2. Patients whose age is above 30 years are included.
3. Both sexes are included.

EXCLUSION CRITERIA:

1. Patients below 30 years.
2. Patients above 60 years of age.
3. Pregnancy.
4. Patients with acute diarrhoeal diseases.
5. Patients with clinical signs of secondary hypertension
6. Patients already on vitamin D supplementation

INVESTIGATIONS:

Following set of investigations were conducted for the selected patients:

- Serum vitamin D
- Serum Urea,
- Serum Creatinine
- Total protein,
- Albumin,
- USG abdomen (if indicated).

STATISTICAL ANALYSIS

TREATMENT

Table 1. Showing number of patients according to therapy level

	Count	Column N %
Single Drug Therapy	30	30.0%
Double Drug Therapy	30	30.0%
Triple Drug Therapy	40	40.0%

Figure 1. Showing number of patients according to therapy level

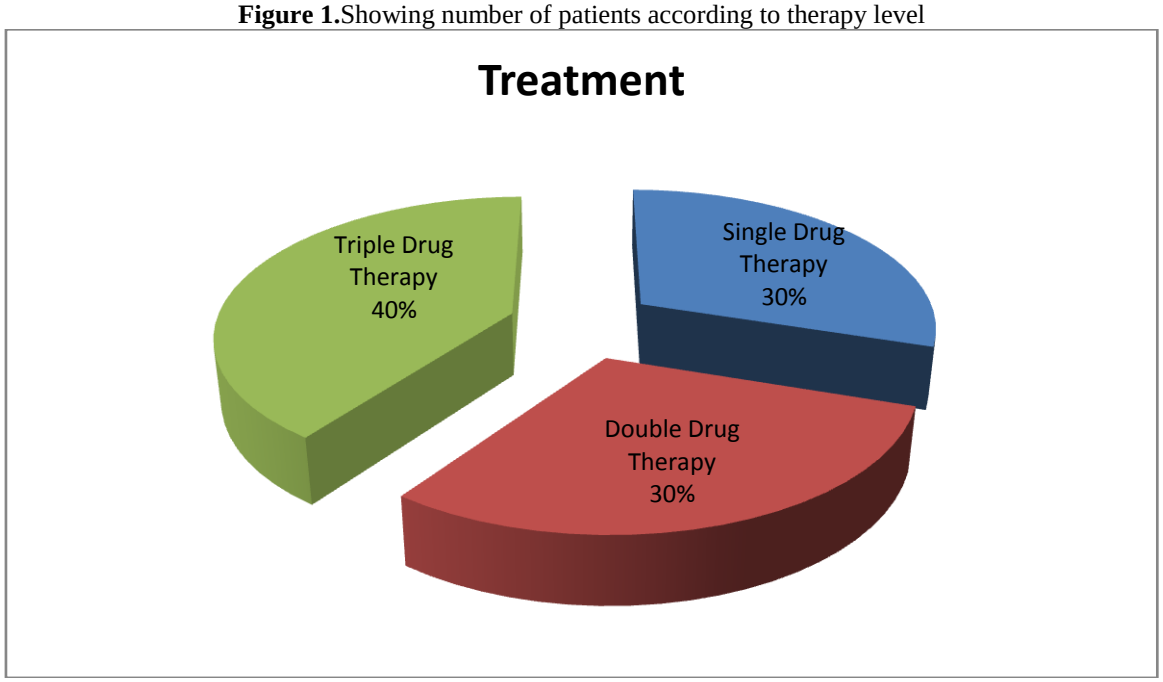


Table 2. Comparison of vitamin-D3 against Treatment:

Vitamin D3									
	Sufficient			Insufficient			Deficient		
	Count	% (Vit-D3)	% (Treatment)	Count	% (Vit-D3)	% (Treatment)	Count	% (Vit-D3)	% (Treatment)
Single Drug Therapy	24	80.0%	80.0%	4	18.2%	13.3%	2	4.2%	6.6%
Double Drug Therapy	5	16.7%	16.7%	9	40.9%	30.0%	16	33.3%	53.3%
Triple Drug Therapy	1	3.3%	2.5%	9	40.9%	22.5%	30	62.5%	75%

Figure 2. Treatment categories as per Different Vitamin D3 levels

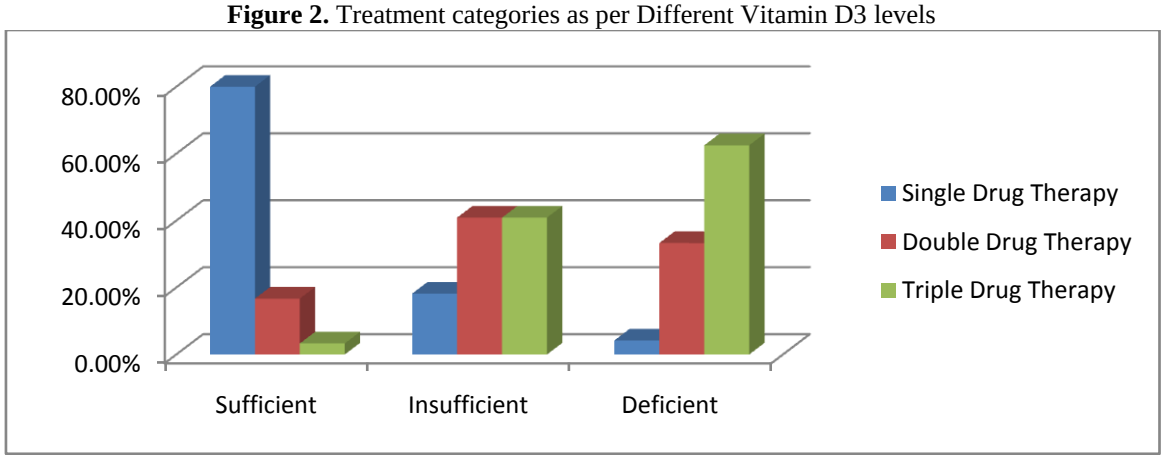


Figure 3 Vitamin-D3 Levels in different categories of Treatment

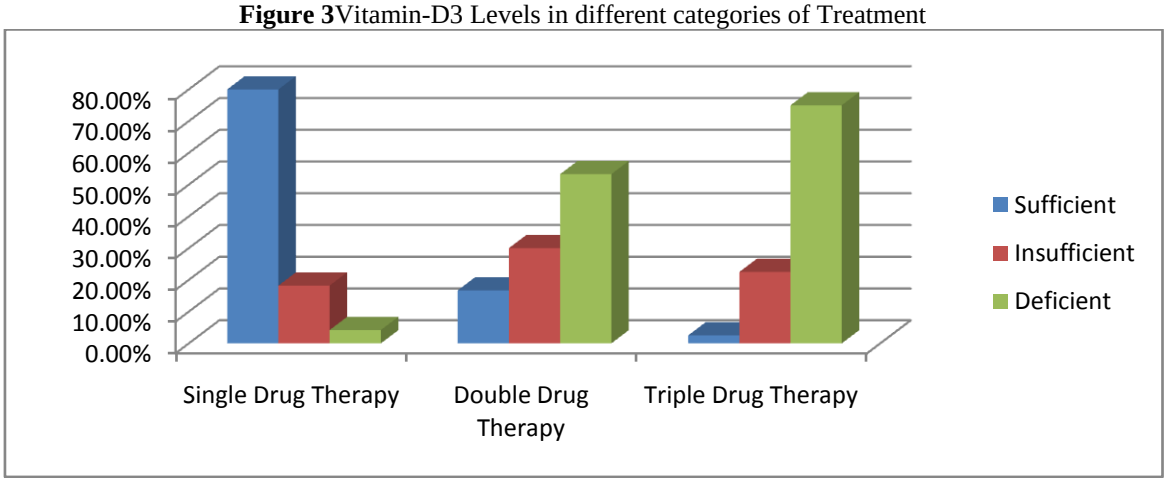


Table 3. Chi-Square test result:

	Value
Chi-square	55.693
Df	4
p-value	.000*

Interpretation: Since p-value for the chi-square test is less than that of 0.05 indicates significance of association between Treatment and Vitamin-D3 Level. It is observed that the therapy level changes with respect to level of vitamin D3. The correlation analysis below confirms the result.

Table 4. Spearman's Rank correlation table:

			Value
Spearman's rho	Vitamin D3	Correlation Coefficient	-.664**
		p-value	.000
		N	100

Interpretation: The negative correlation value of the spearman's rank correlation coefficient (-0.664) with p-value less than that of 0.05 indicates opposite correlation between Level of vitamin D3 (deficient to sufficient) and Treatment (single therapy to triple therapy). That is higher low value of vitamin D3 higher the level of treatment.

THERAPY AGAINST DRUGS:

Table 5. Single Drug Therapy:

		Treatment	
		Count	Column N %
Drugs	Amlodipine (CCB)	6	20.0%
	Atenolol(Beta Blocker)	3	10.0%
	Telmisartan (ARB)	21	70.0%

Figure 4. Single Drug Therapy:

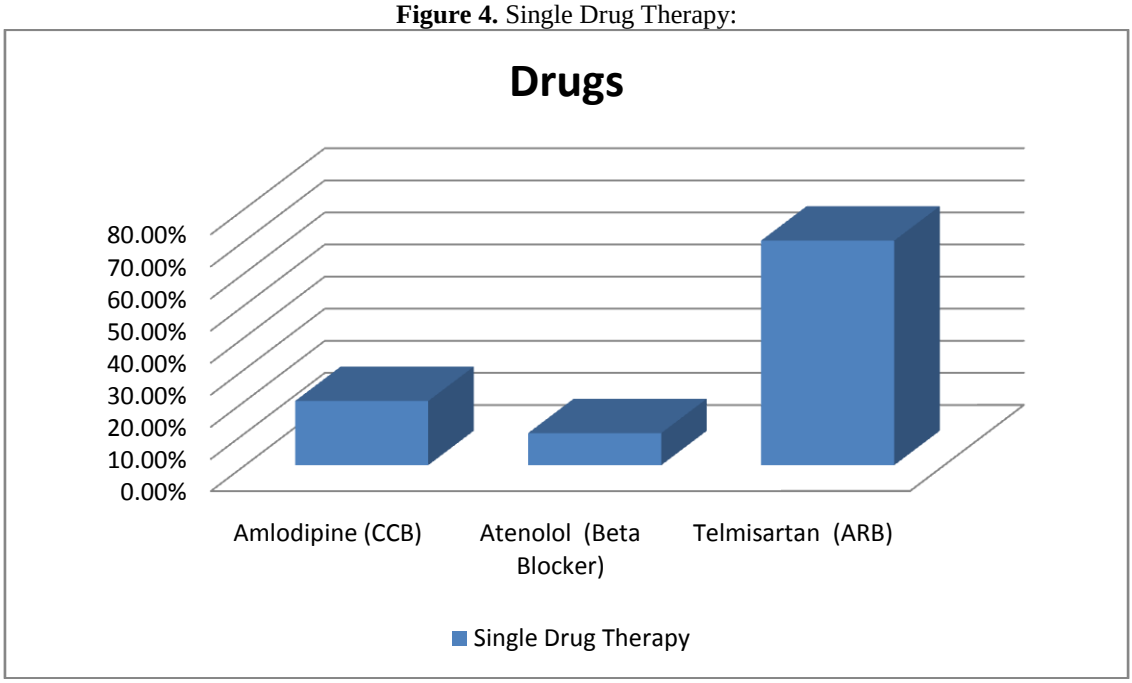


Table 6. Double Drug Therapy:

		Treatment	
		Count	Column N %
Drugs	Atenolol + Amlodipine (Beta Blocker + CCB)	3	10.0%
	Telmisartan + Amlodipine (ARB + CCB)	3	10.0%
	Telmisartan + Hydrochlorothiazide (ARB + Diuretic)	24	80.0%

Figure 5. Double Drug Therapy:

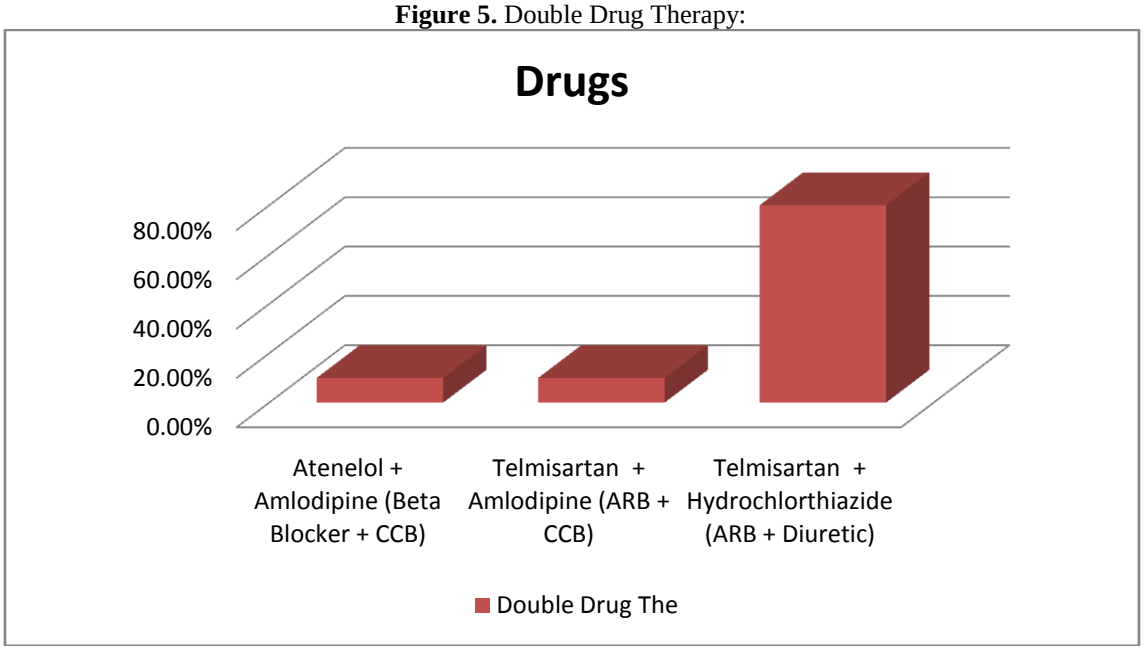


Table 7. Triple Drug Therapy:

		Treatment	
		Count	Column N %
Drugs	Telmisartan + Atenolol + Hydrochlorothiazide (ARB + Beta blocker + Diuretic)	4	10.0%
	Telmisartan + Amlodipine + Hydrochlorothiazide (ARB + CCB + Diuretic)	36	90.0%

Figure 6. Triple Drug Therapy:

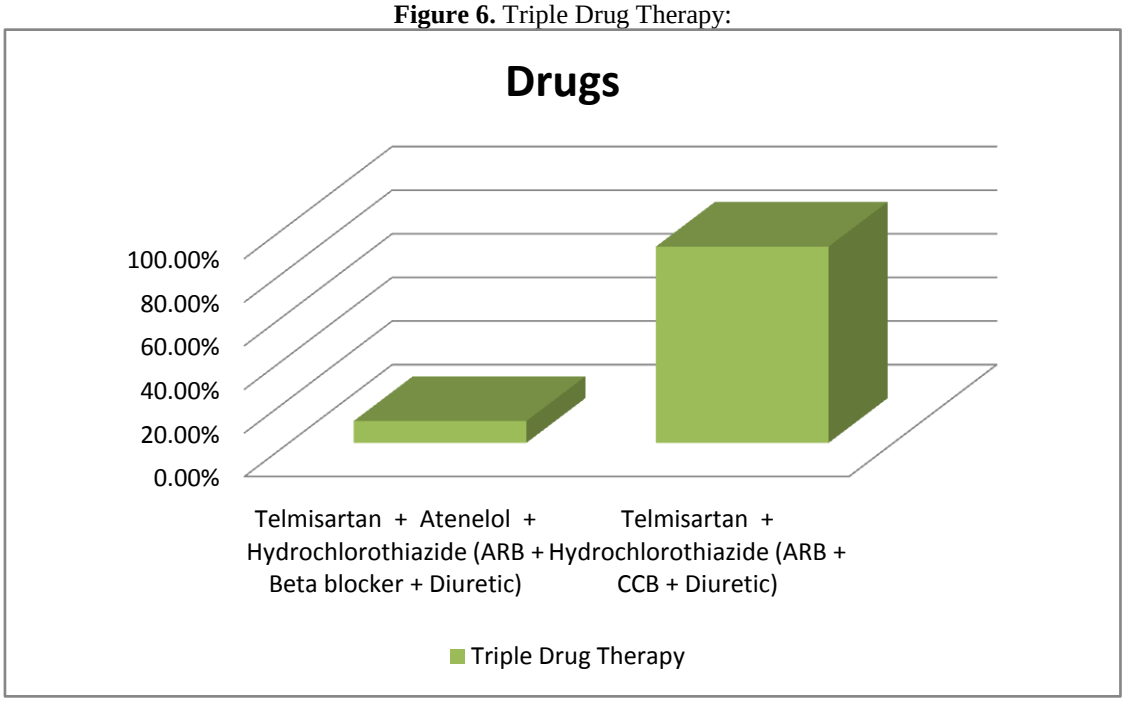
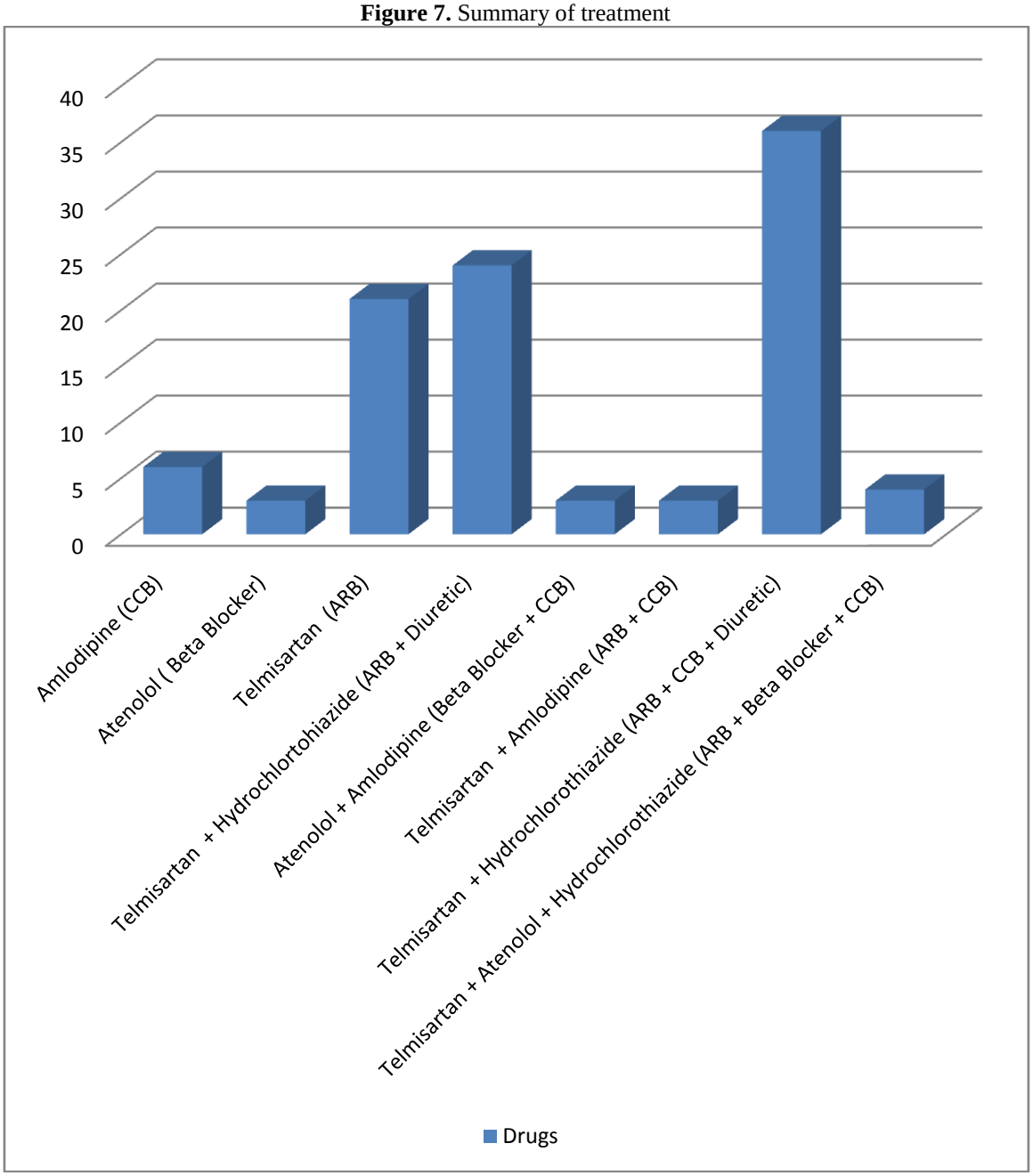


Table 8. Summary of treatment

		Count	Column N %
Drugs	Amlodipine (CCB)	6	6.0%
	Atenolol(Beta Blocker)	3	3.0%
	Telmisartan (ARB)	21	21.0%
	Telmisartan + Hydrochlorothiazide (ARB + Diuretic)	24	24.0%
	Atenolol + Amlodipine (Beta Blocker + CCB)	3	3.0%
	Telmisartan + Amlodipine (ARB + CCB)	3	3.0%
	Telmisartan + Amlodipine + Hydrochlorothiazide (ARB + CCB + Diuretic)	36	36.0%
	Telmisartan + Atenolol + Hydrochlorothiazide (ARB + Beta blocker + Diuretic)	4	4.0%

Figure 7. Summary of treatment



II. Results And Discussion

Results of the analysis revealed 40% of the patients were given triple drug therapy and 30% each in single and double drug therapy treatment. Analysis on the basis of comparison of vitamin D3 against treatment showed that 80% patients who had sufficient vitamin D3 level were given single drug therapy, 16.7% having sufficient vitamin D3 level were given double drug therapy and 3.3% patients having sufficient vitamin D3 level were given triple drug therapy. Similarly, 18.2% patients who had insufficient vitamin D3 level were given single drug therapy, 40.9% patients having insufficient vitamin D3 level were given double drug therapy and 40.9% patients having insufficient vitamin D3 level were given triple drug therapy. And 4.2% patients who had vitamin D3 deficiency were given single drug therapy, 33.3% having vitamin D3 deficiency were given double drug therapy and 62.5% patients having vitamin D3 deficiency were given triple drug therapy.Analysis confirmed that there is a significance of association between Treatment and Vitamin-D3 Level. It is observed that the therapy level changes with respect to level of vitamin D3.The negative correlation value of the spearman's rank correlation coefficient (-0.664) with p-value less than that of 0.05 indicates opposite correlation between Level of vitamin D3 (deficient to sufficient) and Treatment (single therapy to triple therapy). That is higher low value of vitamin D3 higher the level of treatment.Analysis of drugs therapy revealed that Telmisartan (ARB) was the most used drug i.e. 70% as single drug therapy. Amlodipine (CCB) was used by 20% patients. Atenolol (Beta Blocker) was used by 10% patients. In case of double drug therapy Telmisartan + Hydrochlorothiazide (ARB + Diuretic) was given to 80% of the patients followed by Telmisartan + Amlodipine (ARB + CCB) and Atenolol + Amlodipine (Beta Blocker + CCB) which were given to 10% patients respectively. Analysis also showed that in case of triple drug therapy usage Telmisartan + Hydrochlorothiazide (ARB + CCB + Diuretic) were given to 90% of the patients. Combined analysis of all the drugs showed that 36% patients were given Telmisartan + Amlodipine + Hydrochlorothiazide (ARB + CCB + Diuretic), 4% patients were given Telmisartan + Atenolol + Hydrochlorothiazide (ARB + Beta Blocker + Diuretic) 24% patients were given Telmisartan + Hydrochlorothiazide (ARB + Diuretic), 3% patients were given Telmisartan + Amlodipine (ARB + CCB), 3% patients were given Atenolol + Amlodipine (Beta Blocker + CCB). 21% patients were given Telmisartan (ARB), 6% patients were treated with Amlodipine (CCB) and 3% with Atenolol (Beta Blocker).

III. Conclusion:

Many studies in the past have concluded that there is a significant association between vitamin D3 level and hypertension. The present study concluded that for patients having severe vitamin D3 level deficiency, triple therapy should be given for better results and patients who have sufficient level of vitamin D3, may be given single drug therapy. This means that higher low value of vitamin D3 higher the level of treatment. This also supports the fact that there is a relation between vitamin D3 levels and hypertension which has been proven by many studies in the past.

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