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RESEARCH ARTICLE

PREVALENCE OF HYPOCALCEMIA AMONG PATIENTS WITH ESSENTIAL HYPERTENSION IN A TERTIARY CARE CENTRE

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Abstract

Background: Hypertension is a leading public health problem in both developed and developing world. About 1.28 million adults aged 30-79yrs worldwide have hypertension and most of them are living in low and middle income countries. It is the major cause of premature death in world. Every 1 in 5 has their hypertension status under control. It is single important risk factor for cardiovascular disease. Calcium plays an important role in regulating body homeostasis. Association between calcium and hypertension remain uncertain in general population.

Methods: Patients with essential hypertension who attended O.P.D of Internal

Medicine Department of T.D Medical College, Alappuzha was chosen as the study population. Sample size was estimated to be 100. Blood pressure was measured by using standard guidelines and were classified according to JNC-8 guidelines. General and systemic examinations done. Data was entered in excel spreadsheet and analyzed using SPSS software.

Results: Prevalence of Hypercalcemia among essential Hypertension patients was found to be 740 per 1000 persons. The total corrected serum calcium levels had a significant negative correlation with the level and stage of systolic blood pressure in essential hypertensive patients (p value-0.006). The total corrected serum calcium levels had no significant correlation with the diastolic blood pressure in essential hypertensive patients. (p value-0.088)

Conclusions: The total corrected serum calcium levels were significantly lower in essential hypertension patients. Prevalence of Hypocalcemia among essential Hypertension patients was found to be 740 per 1000 persons.

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Introduction

Hypertension remains the leading cause of death worldwide and one of the world's great public health problems. Affecting 1 billion people worldwide, systemic hypertension remains the most common, readily identifiable and reversible risk factor for myocardial infarction, stroke, heart failure, atrial fibrillation, aortic dissection and peripheral arterial disease. Essential hypertension comprises more than 95 per cent of hypertension. Hypertension is an emerging health problem in India. When majority of people come to know that they have hypertension, they have already

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advanced into a stage with target organ damage—a fatal stroke or myocardial infarction, or irreversible renal failure. Although primary hypertension is a heterogeneous disorder, some of the main causes of high blood pressure in primary hypertension are known. For example, overweight and obesity, sedentary lifestyle, excess intake of alcohol or salt, and low potassium intake, are also known to increase blood pressure in many patients who are classified as having primary hypertension.

In a country like India, people tend to have a diet rich in sodium and poor in potassium and calcium. Studies have shown that a decreased intake of sodium and an increased calcium intake or both together may be effective in prevention of hypertension.

In blood, total calcium concentration is normally **8.5-10.5mg/dl** of which 50 percent is ionized. Remainder is bound ionically to negatively charged protein predominantly albumin and immunoglobulins or loosely complexed with phosphate, citrate, sulphate or other anions.

Normal Blood pressure is 120/90 mmHg, according to JNC-8 guidelines and Blood pressure can be classified as prehypertension, Stage 1 hypertension and Stage 2 hypertension as follows.

STAGE	SYSTOLIC BP	DIASTOLIC BP
Normal	<120 AND	<80
Prehypertension	120-139	80-89
Stage 1 Hypertension	140-159	90-99
Stage 2 Hypertension	≥160	≥100

This study aims to prove association between serum calcium levels and essential hypertension. Also this study aims to find association between various stages of hypertension and serum calcium levels and also association between duration of hypertension and serum calcium levels.

Objective

1. To determine the prevalence of hypocalcemia among essential hypertensive patients presenting in medicine OPD of Govt. TDMCA Alappuzha.
2. To find out association between stage of hypertension and serum calcium levels.
3. To find out association between duration of hypertension and serum calcium levels.

Methods

Patients with essential hypertension who attended O.P.D of Internal Medicine Department of TDM Medical College, Alappuzha were chosen as the study population. Sample size was estimated to be 100. A detailed history taking and clinical examination was done in patients with particular reference to hypertension. BP was measured as per JNC – 8 guidelines. Subjects were instructed not to take caffeine or smoking within 30 min preceding the reading and was seated quietly for 5 min in a quiet room after emptying the bladder, with the arm bared and supported at the level of the heart and the back resting against a chair. A mercury manometer with appropriate cuff size was used to measure the blood pressure. Korotkoff sounds phase I (appearance) was taken as systolic BP while phase V (disappearance) was taken as a measure of diastolic blood pressure. Two sets of BP readings were taken 30 min apart in both arms in sitting posture. Lower limb BP was taken in patients less than 40 years of age while BP recordings for postural hypotension was measured for those who aged more than 60 years. Other vital signs, General & Systemic examination was done. Finally, data was analysed in SPSS software.

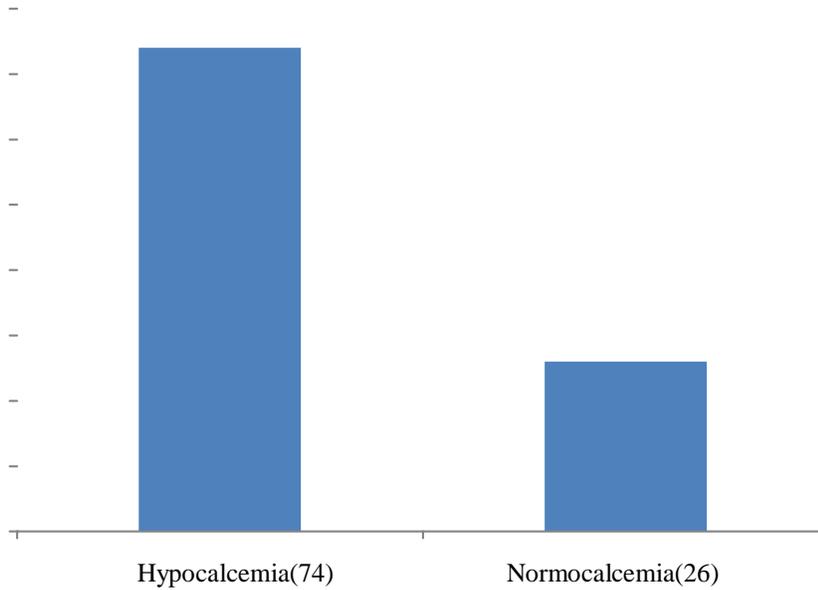
Results

Total no of patients included were 100. The mean age was 63.56 ± 7.29 years. Lowest age was 36 and highest was 91. There were 52 males (52%) and females 48 (48%). Regarding symptoms, majority had no symptoms which was followed by giddiness (32%), headache (18%), while very few had easy fatigability. Duration of hypertension was <10 yrs in 75% while >10 yrs in 25%. Majority of patients were non-smokers and non-alcoholics. And there was no significant family history among patients with essential hypertension. With respect to BMI, 52% were obese while 40% had normal BMI. As far as Systolic BP was concerned, majority fell into Stage 2 hypertension (75%) and 49% fell into stage 1. When coming to Diastolic BP, 51% had stage 1 and 49% had stage 2

hypertension respectively. The total corrected serum calcium levels were significantly lower in essential hypertensive patients (74%).

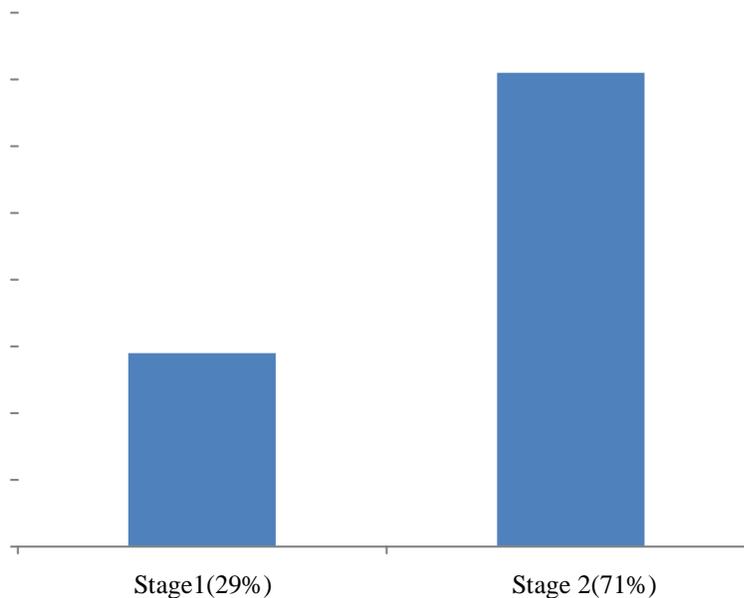
Prevalence of Hypocalcemia among essential Hypertension patients was found to be 74 per 1000 persons. The total corrected serum calcium levels had a significant negative correlation with the level and stage of systolic blood pressure in essential hypertensive patients. (p value-0.006). The total corrected serum calcium levels had no significant correlation with the diastolic blood pressure in essential hypertensive patients. (p value-0.088). The total corrected serum calcium levels showed no significant difference with age, sex, BMI, life style, smoking, alcohol, family history, and duration of hypertension in essential hypertensive patients.

Figure1:- Distribution of hypocalcemia in the population

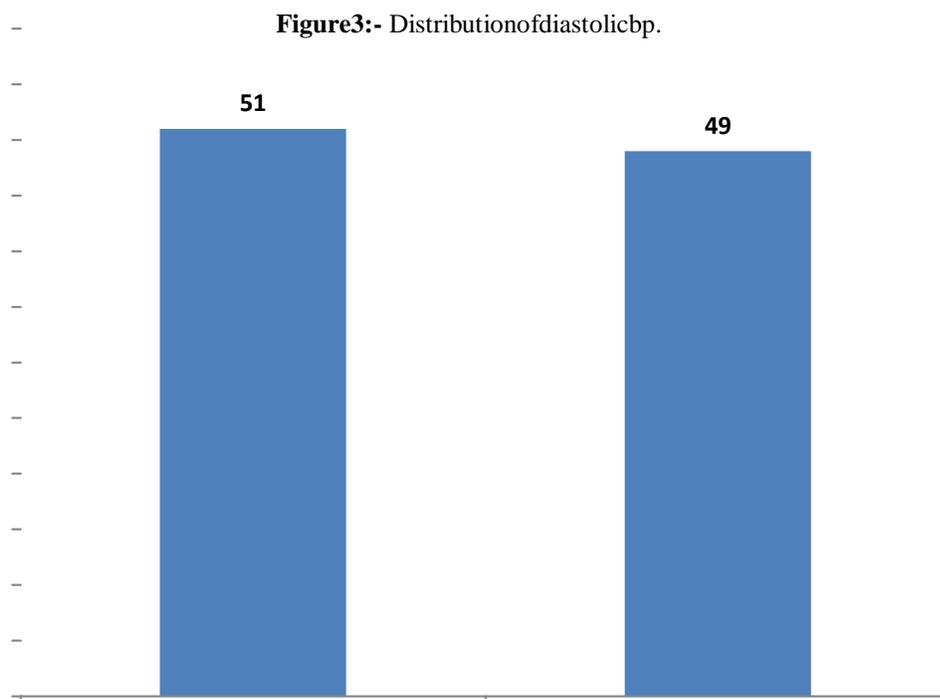


Out of 100 study subjects, 74 had hypocalcemia while 26 had normal calcium level

Figure2:- Distribution of systolic bp.



71 were in stage 2 hypertension when compared to 29 who were in stage 1 with regard to Systolic BP



51 out of 100 were in stage 1 hypertension and 49 were in stage 2 with respect to Diastolic BP

Table 1:- Association of hypocalcemia with systolic blood pressure

Corrected S. Ca Levels				
Systolic BP	Hypocalcemia (N=74)	Percentage	Normal (N=26)	Percentage
STAGE 1 HYPERTENSION	16	55.2%	13	44.8%
STAGE 2 HYPERTENSION	58	81.7%	13	18.3%

Hypocalcemia was **significantly associated** with Systolic BP (pvalue-0.006)

Table 2:- Association of hypocalcemia with symptoms.

Corrected S. Ca Levels				
Symptoms	Hypocalcemia (N=74)	Percentage	Normal (N=26)	Percentage
NIL	36	78.3%	10	21.7%
HEADACHE	13	72.2%	5	27.8%
GIDDINESS	23	71.9%	9	28.1%
HEADACHE & GIDDINESS	0	0	1	33.3%
EASY FATIGIBILITY	2	66.75%	1	33.3%

Hypocalcemia was **not significantly associated** with symptoms of hypertension (pvalue-0.483)

Conclusion

From the present study the following conclusions were made.

1. The total corrected serum calcium levels were significantly lowered in essential hypertensive patients.
2. Prevalence of Hypocalcemia among essential Hypertension patients was found to be 740 per 1000 persons.

3. The total corrected serum calcium levels had a significant negative correlation with the level and stage of systolic blood pressure in essential hypertensive patients.
4. The total corrected serum calcium levels had no significant correlation with the diastolic blood pressure in essential hypertensive patients.
5. The total corrected serum calcium levels showed no significant difference with age, sex, BMI, life style, smoking, alcohol, family history, and duration of hypertension in essential hypertensive patients.

Discussion

Evidence is growing that calcium physiology is altered in essential hypertension, but whether this is a secondary association or a causal relationship is unresolved. Intracellular calcium ions are known to have direct effects on peripheral vascular tone and it has been reported in various trials that hypertensive persons have increased concentrations of intracellular free calcium that decrease to normal levels with antihypertensive treatment. In this study, statistical analysis revealed that the total corrected serum calcium levels were significantly lowered in essential hypertensive patients. There was a statistically significant association between hypocalcemia and systolic BP. We also attempted a correlation between the calcium levels and diastolic blood pressure and found that there was no correlation between the total and corrected serum calcium levels and diastolic blood pressure. Our study also had an objective of comparing total corrected serum calcium levels with various subsets of essential hypertensive population like age, sex, smoking, alcohol, family history of hypertension, lifestyle and BMI. After statistical analysis, it was revealed that there was no significant difference between the calcium levels in the above-mentioned parameters. ARFolsometal., studied the serum calcium fractions in essential hypertensive and matched normotensive subjects. In their study they observed hypertensive subjects had lower mean serum levels of ultra-filterable calcium, ionized calcium, and complexed calcium and higher levels of protein-bound calcium. Calculated serum concentrations of complexed calcium were significantly lower in hypertensive subjects, while protein-bound calcium concentrations were higher. Strazzullo et al., studied several of the biochemical abnormalities of calcium metabolism and were able to detect a significant reduction in total serum calcium levels in hypertensive subjects, although unable to detect a significant reduction in serum ionized calcium levels. This study also reported total and fractional urinary calcium excretion were elevated in subjects with essential hypertension. Erne P, Bolli P., et al., in their study on "correlation of platelet calcium with blood pressure: effect of antihypertensive therapy" reported a decrease in the serum total calcium concentration in essential hypertensive patients. Touyz, R.M., et al., also reported a decrease in the serum total calcium concentration in essential hypertensive patients. Some investigators; McCarron DA., and Resnick LM, Laragh JH., et al., also noted that, compared with normotensive subjects, essential hypertensive subjects had lower serum ionized calcium concentrations even when total calcium levels were similar. Wright GL, Rankin GO., in their study on concentrations of ionic and total calcium in plasma of four models of hypertension noted a lower serum ionized and total serum calcium concentrations in Spontaneously Hypertensive Rats (SHR). By the intervention of dietary calcium intake burden of hypertension can be decreased and this makes this study so relevant. If we detect those people who have a high propensity to develop hypertension in future years and if they are supplemented with calcium levels either in dietary forms or as medications or by adopting measures to reduce the excretion of calcium in their body, we may be able to delay the onset of hypertension in them or may even be able to prevent hypertension.

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