Original Article

Correlation between Serum Calcium Level with Blood Pressure Level In Patients Presenting With Type 2 Diabetes Mellitus

Dur Muhammad Khan , Imran Mahfooz Khan,Fawad Ahmad Randhawa and Muhammad Shahid

Objective: To study the relationship between serum calcium level and blood pressure level in patients presenting with type 2 diabetes mellitus.

Methods: This cross sectional study was conducted at East Medical Ward, Department of Medicine Mayo Hospital Lahore. This study was done in six months period from March 10, 2015-Sep 10, 2015. The non-probability consecutive sampling technique was used in this study. Informed consent and demographic information like name, age and address was recorded. Systolic and Diastolic Blood pressure was measured by using standard and absolute sphygmomanometer. 3ml Blood sample of each patient was taken with informed consent and was sent to the laboratory of the hospital to assess serum calcium level (as per operational definition). Reports were assessed and calcium level was recorded. Pearson correlation coefficient was calculated to measure the relationship between serum calcium level and systolic & diastolic blood pressure. pvalue ≤0.05 was considered statistically significant.

Results: In our study the mean age of the patients was 59.42±11.02 years, 30% patients were males and 70% patients were females. The mean SBP value of the patients was 140.56±11.35 mmHg and mean DBP value was 87.98±6.11 mmHg. In this study the mean value of calcium level of the patients was 8.22±1.24 mg/dl. The negative correlation was observed in our study between the calcium level and SBP, DBP of the DM patients i.e. r= -0.665 & -0.401 respectively

Conclusion: The study concluded that negative correlation was observed between the serum calcium level and the blood pressure level in patients presenting with type 2 diabetes mellitus.

Keywords: Serum Calcium, Type 2 diabetes mellitus, blood pressure.

Introduction

Hypertension is up to three times more common in patients with diabetes contributing its major effect in development of macro vascular complications.[1] Hypertension affects 34%of US adults and African American adults have among the highest rates of hypertension in the world at 44%.[2] At present, it is estimated that about 1 billion people worldwide have hypertension (>140/90 mmHg), and this number is expected to increase to 1.56 billion by 2025.[3] According to WHO, the total prevalence of diabetes in 2011 in Pakistan was 12.9 million (10% of total population) . It has been estimated that Pakistan is known as the 7th largest country in terms of highest prevalence of diabetes and will be 4th largest by the year 2030.[4] In a report, it was shown that 18% of people in Pakistan suffer from hypertension with every third person over the age of 40 becoming increasingly vulnerable to a wide range of diseases. It was also mentioned that only 50% of the people with hypertension were diagnosed and that only half of those diagnosed were ever treated. Thus, only 12.5% of hypertension cases were adequately controlled.[5]Cardiovascular and kidney functions have a significant dependency on serum calcium levels and calcium homeostasis is an integral part in carrying out the physiologic functions of these systems.[6] Studies have concluded that there is a significant difference in serum levels of calcium in hypertensive and normotensive individuals. Amongst the different forms of serum calcium that are present in the serum, it's the ionized form that is physiologically active .[7,8] extracellular calcium levels are in strict check under the effects of different endocrine systems and any alterations in its normal values may affect the intracellular calcium levels too and possibly can contribute towards development of hypertension.[9] Behradmanesh S et al inferred a significant inverse correlation between serum calcium and diastolic blood pressure (DBP) (r= -0.261, p=0.046). Interestingly, the statistically insignificant reverse relationship was observed with systolic blood pressure (SBP) and serum calcium levels (r= -0.232, p=0.080).[10] to make the matters more intriguing and interesting, Phillips A

et al reported way back in early 1990s a significant correlation between serum calcium and both SBP and DBP (r = 0.15 and 0.11, respectively; P<0.0001).[11] In order to make these associations more clear this research idea was launched on this relationship of both variables with a rationale to measure the relationship between calcium level and blood pressure (BP) in diabetic patients as hypertension control is of prime importance in diabetics and carries equal weightage as glycemic control to control microvascular and macrovascular complications. Previously mixed results have been noted and different criteria have been employed and the results of those studies few of them are already mentioned provided us with different results of the relationship of these variables. Very weak relationship has been observed which showed that decrease in calcium may cause elevation in BP (negative correlation), while other reported positive correlation (i.e. decrease in calcium may cause decrease in blood pressure). So to resolve this controversy, this study was conducted to study the relationship between BP and serum calcium in diabetic patients. This will help us to plan management option for such cases to prevent them from hazardous events like stroke or MI, as these are very common in diabetic patients.

Methods

A sample size of 150 cases were calculated with5% type I error, 10% type II error and taking value of correlation coefficient i.e. r = -0.232 between serum calcium level and blood pressure of diabetic patients with non-probability consecutive sampling. Patients of age between 40-80 years of either gender with diabetes mellitus (as per operational definition) for at least 1 year were included in the study. Current smokers (>1pack year), patients taking calcium or vitaminD supplements (on medical record), patients taking antihypertensive medicines (on medical record), patients with CKD patients stages 3 and 4 not taking calcium or vitamin D supplements.[12]were excluded. A total of 150 patients fulfilling the inclusion and exclusion criteria were included in the study from Outpatients Department of Medicine, Mayo hospital, Lahore. Informed consent was obtained. The demographic information like name, age and address was recorded. Systolic and Diastolic Blood pressure was measured by using standard and absolute sphygmomanometer. 3ml Blood sample of each patient was taken with informed consent and was sent to the laboratory of the hospital to assess serum calcium level. Reports were assessed and calcium levels were recorded. Data was collected in a predesigned proforma.Data was analyzed in SPSS version 20. Mean ± SD was calculated for age, systolic & diastolic blood pressure and serum calcium level. Frequency and percentage were measured for gender. Pearson correlation coefficient was calculated to measure the relationship between serum calcium level and systolic & diastolic blood pressure. *P* value ≤0.05 was considered statistically significant.

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In this study a total of 150 cases were enrolled.

Table-1: Descriptive statistics.

	SBP	DBP	Serum Calcium
Mean	140.56	87.98	8.22
SD	11.35	6.11	1.24
Minimum	120.00	80.00	6.00
Maximum	160.00	100.00	10.20

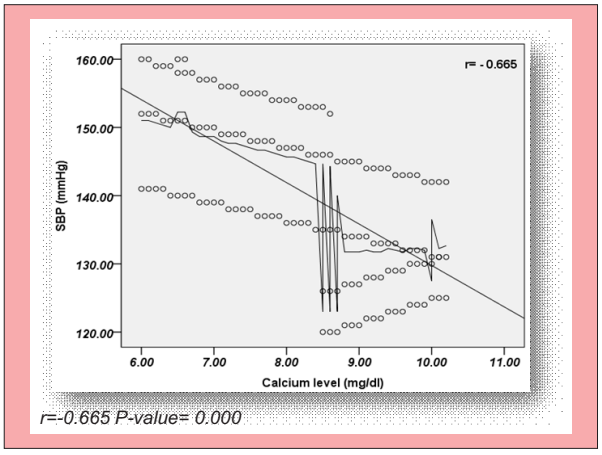

Fig-1: Correlation between the calcium level & SBP.

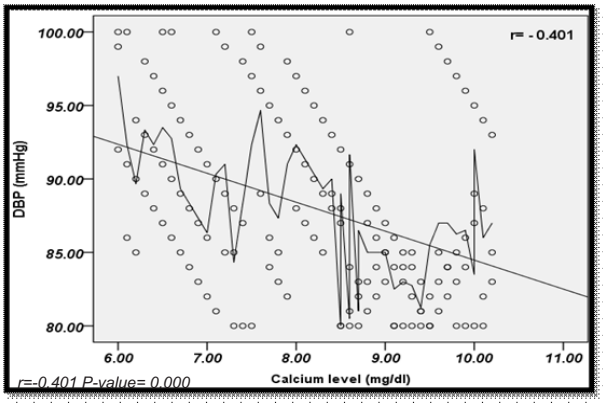

Fig-2: Correlation between the calcium level & DBP.

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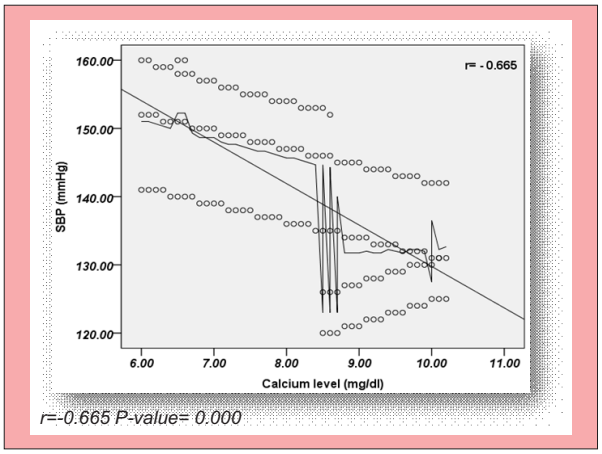

Fig-1: Correlation between the calcium level & SBP.

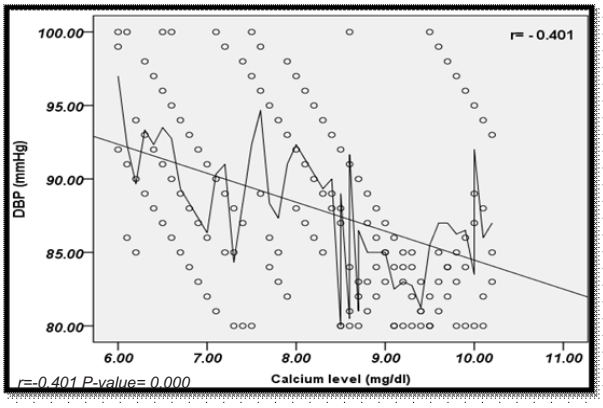

Fig-2: Correlation between the calcium level & DBP.

Levels and the blood pressure level in patients presenting with type 2 diabetes mellitus. Further cohort studies need to be conducted to observe whether calcium replacement in hypocalcemic normotensive type 2 diabetic patients can prevent the development of hypertension and the study should expand and should include non-diabetics as well to see the pattern.

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