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Comparison of Various Factors in Patients of Essential Hypertension with and Without Vitamin D Deficiency Presenting To Family Practice

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ABSTRACT

Objective: To compare various factors in patients of hypertension with and without Vitamin D Deficiency managed at family medicine department of our hospital.

Study Design: Comparative cross-sectional study

Place and Duration of Study: Department of Family Medicine, Pak Emirates Military hospital, Rawalpindi Pakistan, From September 2022 to November 2022.

Methodology: Patients of hypertension presenting at family medicine department without having any other metabolic illness were recruited in the study. Baseline investigations were carried out in all patients along with Vitamin D levels. Patients were divided into two groups for the sake of comparison as with and without vitamin D deficiency. Factors like age, gender, deranged lipid profile parameters and body mass index were compared in both the study groups.

Results: Out of 206 patients of hypertension included in the study, 144(69.9%) were male while 62(30.1%) were female. Mean age of the study participants reporting at family medicine department was 46.06±9.65 years. Out of two study groups used for comparison, 84(40.7%) of the patients had Vitamin D levels within range while 122(59.3%) had deficient vitamin levels. Statistical analysis revealed that deranged lipid profile parameters and high body mass index were found statistically significantly (p-value <0.05) more in group of patients having Vitamin D deficiency as compared to those who did not have vitamin D deficiency suffering from hypertension managed at family medicine department.

Conclusion: Vitamin D deficiency was a common finding in patients managed for hypertension at family medicine department. Deranged lipid profile parameters and being overweight or obese were the factors associated with Vitamin D deficiency among patients of hypertension in our study.

Keywords: Family medicine; Hypertension; Lipid profile; Vitamin D.

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INTRODUCTION

Medical professionals from almost all the specialties have to in one way or the other deal directly or indirectly with hypertension of related issues as this ailment is highly prevalent in all parts of the world.[1] Trend of rise in this non-communicable illness is not different in Pakistani population and recent figures have really been alarming in this regard.[2] This illness usually doesn't require intervention in one aspect but needs attention of treating team from various metabolic and other relevant aspects.[3] Life style management and pharmacotherapy are mainstay of management for this illness and multiple medications used to control hypertension may pose different type of adverse effects.[4]

In classical times, vitamin D was considered to be important nutrient required for wellbeing of bones and muscles but recent research suggests that this is an important nutrient required by human body for overall wellbeing.[5] Even while looking at the causes of deficiency and methods to manage the deficiency, clinicians should not have tunnel vision and focus on only renal and intestinal causes but a broader knowledge of all comorbid illnesses and medications should be incorporated in this regard.[6]

Association between Vitamin D levels and changes in blood pressure have been documented in studies published in recent past. A recent meta-analysis after adjusting publication bias though reported negative findings and it was concluded that results previously were due to publication bias and no association exist between Vitamin D levels and risk of hypertension.[7] Karadeniz *et al*., published a study in 2021 from Turkey revealing that Vitamin D deficiency was associated with raised blood pressures in their study participants.[8] Similar study was published in 2017 from South Africa and it was concluded that

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patients who were not taking blood pressure medication were more at risk of having higher blood pressures if they had Vitamin D deficiency.[9]

Nutrition statistics are not up to the mark in our part of the world and vitamin deficiencies are seen commonly in almost all the clinical settings. Family practice is usually the first clinical setting in which patients report and are managed for routine ailments. A recent local study published in Pakistan Post graduate Medical Journal revealed that most of the patients suffering from Diabetes and Hypertension had Vitamin D deficiency in our part of the world.[10] Limited local data has been available regarding various vitamin deficiencies in patients of chronic diseases like hypertension. We therefore planned this study with the rationale to look for vitamin D deficiency and factors associated (age, gender, lipid profile parameters, BMI) with this deficiency among patients of hypertension managed at family medicine department of our hospital.

METHODOLOGY

This comparative cross-sectional study was conducted at the Family Medicine department of Pak Emirates Military Hospital Rawalpindi between September 2022 to November 2022. Patients of hypertension were divided into two groups for the sake of comparison as with vitamin D deficiency and normal Vitamin D levels. Sample size was calculated by using the World Health Organization sample size calculator by using the two groups. Group I with patients of hypertension without Vitamin D deficiency =8.7% and group-II were patients of hypertension with Vitamin D deficiency =77%.[11] Non probability consecutive technique was used to gather the sample for the study.

Inclusion Criteria: Patients of both genders of age between 18 and 65 years managed at family medicine outpatients' department for hypertension were recruited.

Exclusion Criteria: Patients with diagnosed rickets, osteomalacia, osteoporosis or parathyroid hormonal problems were excluded. Those with any congenital illness or syndromes from early childhood were not recruited in study. Patients with uncontrolled DM, acute or chronic renal failure or malabsorption syndromes were excluded as well. Patients taking any supplements having vitamin D or any medications interfering with absorption or metabolism of vitamin D were also not included in the study.

Ethical approval for the study was obtained from the ethical review board committee of PEMH via letter number A/28/216/EC/479/2022. Patients were recruited if they gave consent after detailed information about study protocols. Patients who were managed for hypertension in family medicine OPD with having diagnosis of essential or primary hypertension for more than 6 months and less than 10 years were made part of the study. All the patients underwent detailed physical and laboratory investigations including Vitamin D levels and fasting Lipid profile. Body mass index was calculated by one the family medicine doctors in the clinic during the visit. All the details of the patients regarding the study variables were noted on a proforma designed for this study and were kept confidential with the chief researcher till the end of the study.

Vitamin D levels were assessed in laboratory of own hospital under supervision of consultant chemical pathologist. Levels of Vitamin D less than 20 ng/ml were used as cut off value for establishing vitamin deficiency among the study participants.[12] Fasting lipid profile was done in the same laboratory by set protocols and levels of different parameters were interpreted as per international standards.[13] Body mass index was calculated by the doctor and interpreted as 25 or more as overweight and 30 or more as obese.[14]

Characteristics of participants and the distribution of the vitamin D levels among patients of hypertension were described by using the descriptive statistics. Association of age, gender, deranged lipid profile and body mass index with presence of Vitamin D deficiency among patients of hypertension managed at family medicine department was established by applying the Pearson chi-square test keeping the *p*-values ≤ 0.05 as significant. Statistical Package for the Social Sciences (SPSS) version 23:00 was used for this purpose by the research team.

RESULTS

A total of 206 patients of hypertension presenting at family medicine outpatient were included in the study. Out of them, 144(69.9%)were male while 62(30.1%) were female. Table-I summarized the general characteristics of patients recruited for this analysis. Mean age of the study participants reporting at family medicine department was 46.06±9.65 years. Patients were divided into two groups for comparison. Out of total patients of hypertension managed at family outpatients' department, 84(40.7%) of the

patients had Vitamin D levels within range while 122(59.3%) had deficient vitamin levels.

Table-I: Characteristics of Patients Managed for Hypertension at Family Medicine Department (n=206)

Study Parameters	n (%)
Age (years)	
Mean+SD	46.06 ±9.65
Range (min-max)	18 years-65 years
Gender	
Male	144(69.9%)
Female	62(30.1%)
Presence of Vitamin D Deficiency	
No	84(40.7%)
Yes	122(59.3%)
Body mass Index	
Normal	148(71.8%)
Overweight	30(14.5%)
Obese	28(13.6%)
Abnormal Lipid Profile Parameters	
Raised Cholesterol	27(13.1%)
Raised Triglycerides	22(10.7%)
Raised Low density lipoproteins	22(10.7%)
Decreased High density lipoproteins	10(4.9%)

Table-II summarized the results of Statistical analysis. Two groups were made for the sake of comparison. One group comprised of patients of hypertension without Vitamin D deficiency 84(40.7%) and other group comprised of patients of hypertension with Vitamin D deficiency 122(59.3%). It was revealed that deranged lipid profile parameters (p-value<0.001) and high body mass index (p-value<0.001) were found statistically significant in group of patients with Vitamin D deficiency when compared with group of patients with normal vitamin D levels among our study participants. Table-III showed the comparison of individual lipid profile parameters in patients with and without vitamin D deficiency and it also turned out to be significant (p-value<0.001)

Table-II: Association of Different Factors with Vitamin D levels Among Patients of Hypertension (n=206)

Factors	Normal Vitamin D levels n=84	Vitamin D deficiency n=122	p-value
Age			
50 year or less	58(69.1%)	79(64.7%)	
>50 years	26(30.9%)	43(35.3%)	0.520
Gender			
Male	64(76.2%)	80(65.5%)	
Female	20(23.8%)	42(34.5%)	0.100
Lipid profile parameters			
Normal	76(90.4%)	49(40.2%)	<0.001
Abnormal	08(9.6%)	73(59.8%)	
Body Mass Index			
Normal	77(91.6%)	71(58.1%)	
Overweight or obese	07(8.4%)	51(41.9%)	<0.001

Table- III: Comparison of Individual Lipid Profile Parameters in Two Groups (n=206)

Parameters	Normal vitamin D levels n=84	Abnormal vitamin D levels n=122	p-value
Normal	76(90.5%)	49(40.1%)	
Raised cholesterol	01(1.1%)	26(21.3%)	
Raised triglyceride	02(2.2%)	20(16.4%)	
Raised Low density lipoproteins levels	03(3.5%)	19(15.5%)	<0.001
Decreased high density lipoprotein levels	02(2.2%)	08(6.5%)	

DISCUSSION

Metabolic pathways of human body are very interesting and complex. Derangement of one biochemical substance usually cannot be attributed to or affect one organ system. Multiple system functions of human body may get impaired by derangement of just one micronutrient. Patients of hypertension may suffer from a lot of metabolic problems.[7] Vitamin D deficiency in these patients may be due to some common pathway or effect of changes of long standing hypertension or may be as adverse effect of treatment of hypertension. These two conditions co-existing can have gross negative impact on the patients. We conducted this study with an aim to look for vitamin D deficiency and factors associated with this deficiency among patients of hypertension managed at family medicine department of one of the biggest military hospitals of our country.

A study was published from Saudi Arabia in 2020 with an aim to look for association of low Vitamin D levels with different types of cardiovascular ailments. It was concluded that different types of cardiovascular diseases including hypertriglyceridemia were associated with Vitamin D deficiency.[15] Our study results supported the findings generated in Saudi patients as Vitamin D deficiency was seen in most of the patients with hypertension included in our study and was associated with deranged lipid profile parameters as well.

Ong *et al.*, published a study in 2008 regarding prevalence and factors associated with Vitamin D deficiency in obese patients managed for weight related problems. It was revealed that most of the patients recruited in their study had Vitamin D deficiency.[16] Our study findings revealed that Vitamin D deficiency was a common finding in patients managed for hypertension at family medicine department. Deranged lipid profile parameters and

being overweight or obese were the factors associated with Vitamin D deficiency among patients of hypertension in our study.

A study published in Denmark studied impact of Vitamin D status on changes in cardiovascular wellbeing. They came up with the findings that optimal levels of vitamin D keep lipid profile parameters in optimal state thus prevent blood pressure problems and metabolic syndrome.[17] Our results also showed similar findings as Vitamin D deficiency was found in considerable number of patients suffering from hypertension and was associated with deranged lipid profile parameters.

Alagacone *et al*., in 2020 published a study from USA and looked for association of Vitamin D deficiency with resistant hypertension. It was concluded that statistically significant association existed between Vitamin D deficiency and treatment resistant hypertension. We did not include patients of resistant hypertension but in patients of essential hypertension we found Vitamin D deficiency was a common finding.

LIMITATIONS OF STUDY

There were few limitations in our study. Cause and effect relationship between hypertension and Vitamin D deficiency could not be established with this design. Independent variables affecting the dependent variables could also not be studied with accuracy via current study design as number of confounding factors could affect Vitamin D levels.

CONCLUSION

Vitamin D deficiency was a common finding in patients managed for hypertension at family medicine department. Deranged lipid profile parameters and being overweight or obese were the factors associated with Vitamin D deficiency among patients of hypertension in our study.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

NN & SN: Data acquisition, data analysis, critical review, approval of the final version to be published.

AK & ST: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

HT & AN: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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