Original Article

To Find Out the Association of Vitamin D Levels on Blood Pressure

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ABSTRACT

Objective: To explore the association of vitamin D levels on the Blood Pressure.
Study Design: Observational / cross sectional study
Place and Duration of Study: This study was conducted at the Department of Physiology at Khyber Medical College/Teaching Hospital in Peshawar from January, 2020 to December, 2020.
Materials and Methods: Subjects were recruited according to the inclusion criteria. Patients were divided into three cohorts; Stage I hypertension (Group I), Stage II (Group II) hypertension and a third group (Control group). Blood for Vitamin D Levels was taken and analysed at the Hospital Lab. Blood Pressure readings in mm Hg via Yamasu mercury sphygmomanometer. All information was recorded using proforma and analysed on IBM SPSS for MacBook, Version 26.0.
Results: Mean and Standard Deviations (SD) for the levels of vitamin D (ng/mL) recorded as 34.77 ± 7.18 for control group, 26.91 ± 9.75 for Group I and 26.21 ± 9.14 for Group II. For the Control Group, Mean and SD for systolic blood pressure (SBP) and diastolic blood pressure (DBP) were recorded as 111.52 ± 4.69 mm Hg and 74.36 and ± 3.41mm Hg respectively. Group I, Mean and SD for SBP and DBP were recorded as 130.17 ± 7.93 mm Hg and 92.09 ± 5.46 mm Hg respectively. Group II, Mean and SD for SBP and DBP were recorded as 145.08 ± 18.98 mm Hg and 102.98 ± 11.95 mm Hg respectively.
Conclusion: Our study finds out a positive association of lower vitamin D levels with raised Blood Pressure.
Key Words: Blood Pressure; Vitamin D; Vitamin D Deficiency; Fat Soluble Steroid

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INTRODUCTION

The effects of Vitamin D on the various organ systems of the body may be categorized as Pleotropic in nature. Many of the time the deficiency of Vitamin D has been associated and liked to raised or higher blood pressure levels. There have been many interventional studies that recorded and examined the effect of vitamin D levels to the levels of blood pressure.

High Blood Pressure or Hypertension is a very common chronic illness prevalent in the current era. Hypertension is considered as a silent killer because of the symptomatology[1,2]. Over the one decade the patients having hypertension have risen by almost 2% (from 23.8% to 25.4%)[3,4].

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There have been many interventional studies that recorded and examined the effect of vitamin D levels to the levels of blood pressure. Still, many systemic reviews, meta-analysis and level I evidence studies are going on to understand the medical condition. It is therefore adamant to explore and find out the association and correlation of vitamin D levels on the Blood Pressure.

In our study we have included new-onset or newly diagnosed hypertensive patients. These patients were divided into two cohorts; Stage I hypertension, Stage II hypertension and a third group that included healthy individuals as the control group.

MATERIALS AND METHODS

A study was performed in the Department of Medicine at Khyber Teaching Hospital in Peshawar from January 2020 to December 2020. Inclusion criteria included patients older than age 20, of female sex, with new-onset or newly diagnosed hypertensive patients. Exclusion criteria included patients with low vitamin D levels, Kidney disease, secondary hypertension, thyroid, liver or parathyroid related medical conditions. These were excluded. Sixty (60) patients were divided into three cohorts; Stage I hypertension, Stage II hypertension and a third group that included healthy individuals as the control group. Blood for Vitamin D Levels was taken and analysed at the Hospital

Laboratory via Cobas 6000 E 501 analyzer. Blood Pressure readings in mm Hg via Yamasu mercury sphygmomanometer. Written informed, voluntary consent was obtained. The Institutional Review and Ethics Board approved the study. All Confounding variables will be controlled by exclusion criteria. Bias will be controlled by following strict inclusion criteria for patient selection, diagnosis of new hypertensive patients with measurable operational definitions and using same methods and parameters for blood pressure and vitamin D levels. All the data will be collected on a research proforma for this study's protocol. All information was recorded using proforma and analysed on IBM SPSS Statistics for Windows, Version 26.0. (Armonk, NY: IBM Corp.).

RESULTS

Sixty (60) patients divided into three cohorts; Stage I hypertension, Stage II hypertension and a third group that included healthy individuals as the control group. Mean and standard deviations for age were recorded as 34.5 ± 10.1. Whereas the Mean and standard deviations for the levels of vitamin D (taken in ng/mL) were recorded as 34.77 ± 7.18 for the control group, 26.91 ± 9.75 for patients in group I and 26.21 ± 9.14 for the patients in group II.

For the Control Group, Mean and standard deviations for systolic blood pressure (SBP) were recorded as 111.52 ± 4.69 mm Hg. While Mean and standard deviations for diastolic blood pressure (DBP) were recorded as 74.36 ± 3.41mm Hg. Stage I Hypertension Group, Mean and standard deviations for systolic blood pressure (SBP) were recorded as 130.17 ± 7.93 mm Hg. While Mean and standard deviations for diastolic blood pressure (DBP) were recorded as 92.09 ± 5.46 mm Hg. For Stage II Hypertension Group, Mean and standard deviations for systolic blood pressure (SBP) were recorded as 145.08 ± 18.98 mm Hg. While Mean and standard deviations for diastolic blood pressure (DBP) were recorded as 102.98 ± 11.95 mm Hg.

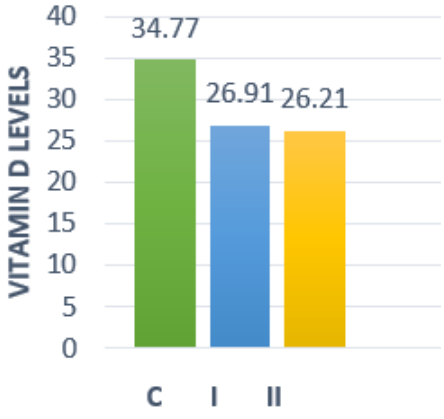

Figure No.1: Mean Vitamin D Levels (ng/mL) for the three groups.

Figure 1 shows the levels the vitamin D for all the three groups; Stage I hypertension (I), Stage II hypertension (II) and a third group that included healthy individuals as the control group (C)

I= Stage I hypertension, II=Stage II hypertension, C= Control Group (Healthy females)

Table No.1: Shows vitamin D levels have an inverse relation with the blood pressure readings as it changed from normotensive (control group) to stage I and stage II hypertensive patients

	Control (n=25)	**Stage I Hypertension (n=25)**	**Mean difference**	**p-value**
Vitamin D (ng/mL)	34.77 ± 7.18	26.91 ± 9.75	7.86	0.015
Systolic BP (mmHg)	111.52 ± 4.69	130.17 ± 7.93	(-)18.65	0.000
Diastolic BP (mmHg)	74.36 ± 3.41	92.09 ± 5.46	(-)17.73	0.000
	Control (n=25)	**Stage II Hypertension (n=25)**	**Mean difference**	**p-value**
Vitamin D (ng/mL)	34.77 ± 7.18	26.21 ± 9.14	8.56	0.015
Systolic BP (mmHg)	111.52 ± 4.69	145.08 ± 18.98	(-)33.56	0.000
Diastolic BP (mmHg)	74.36 ± 3.41	102.98 ± 11.95	(-)28.62	0.000

DISCUSSION

We found out in our study that lower levels of vitamin D were associated with high blood pressure. The Hypertensive Group I and Group II showed lower than normal levels of vitamin D (Mean) on average. The mean difference to the Control group was 7.86 ng/mL for the Hypertensive Group I and 8.56 ng/mL for the Hypertensive Group II (Fig. 1 and Table. 1)

Some studies have found out that hypertension has an association with the months that have relatively lower temperatures. Also, in parts of the world or regions that are far from the equator where the radiation of sun is low. The study found out that as we go 10 degrees away from the equator, this will lead to a rise in the blood pressure by 2.5 mm Hg and hypertension by 2.5% [5,6,7].

Here is an interesting fact about the Vitamin D levels and the African American population. African Americans' population shows a 15% difference for Hypertensive prevalence (40%), in comparison to white Americans' 25% prevalence of hypertension. The African-Americans population is at a higher risk for

developing hypertension. This leads to further target organ damage and subsequently, causes to morbidity and mortality [8,9,10]. Hence, we postulate and deduce the inference that the UV rays and skin's ability to convert vitamin D to its active form, has a connection to hypertension.

In an experimental study, Krause, et al. exposed the ultraviolet light (type B) to subjects that had both; Vitamin D deficiency and mild essential hypertension (EH). It was concluded that the type B UV Radiation not only caused an increase in the active vitamin D levels but also brought down the blood pressure levels in patients that showed Vitamin D deficiency and had EH. These results were instrumental and has since 1998, lead to extensive research on the subject[11].

CONCLUSION

Our study found out that relation exists between lower vitamin D levels and raised Blood Pressure. There have been many interventional studies that recorded and examined the effect of vitamin D levels to the levels of blood pressure. Still, many systemic reviews, meta-analysis and level I evidence studies are required for not only to understand the medical condition but also establish a possible link and to further help us understand the pathophysiology governing this change of blood pressure with the variation in the vitamin D levels.

Author's Contribution:

Concept & Design of Study:	Syed Shahmeer Raza
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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