



Investigating the relationship between hypertension and regular consumption of vitamin D

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ABSTRACT

Introduction: Hypertension (HTN) is one of the most life-threatening disorders worldwide. Although some examinations have demonstrated an incidental relationship between blood pressure and serum level of 25-hydroxyvitamin D, there have been new exchanges of views with respect to the influence of low vitamin D levels in hypertension. This study aims to find out the relationship between hypertension and regular consumption of vitamin D.

Methods: A case-control study was conducted with regard to secondary data (SINA system) among people, aged 30 years old or older, registered in 2017-2018. A sample size of 1,500 patients was used comprising of 500 patients with hypertension as the case group and 1,000 people without history of hypertension as the control group. The population was selected randomly. High blood pressure diagnostic criteria were considered in the same manner with the clinical guidelines of the 7th National Joint Committee. Data were analyzed using SPSS 22 software.

Results: Regular consumption of vitamin D had a protective role on hypertension (P value <0.05) and [OR= 0.421 (0.353- 0.505)].

Conclusion: By identifying hypertension risk factors, taking measures to prevent it would be more practical and the risk of hypertension can be reduced. An enormous volume of epidemiological and empirical proof is indicative of the fact that vitamin D deficiency can lead to high blood pressure. The present investigation proves that vitamin D supplementary may serve as a convenient method to diminish the risk of progression of increased blood pressure due to its protective effect on blood pressure.

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Introduction

Hypertension or blood pressure spike is accounted for as a major impairment resulting in disability-adjusted life years (DALYs) across the world (1, 2). High blood pressure is known as the leading cause and conspicuous risk factor for illnesses such as strokes (3), heart attacks, chronic progressive conditions that affect the pumping power of the heart muscles, narrowing of the peripheral arteries serving the legs, stomach, arms and head, quivering or irregular heartbeat (arrhythmia) that

can lead to blood clots, stroke, heart failure and other heart-related complications, and the last stage of chronic kidney disease (4-8).

With numerous etiological variables, HTN incorporates age, race, family background, overweight, inactive way of life, utilizing tobacco, high salt ingestion, stress, and having alcoholic drinks to a great deal (9).

Classically, vitamin D regulates bone and mineral metabolism (7, 10, 11). Low circulation of vita-

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min D raises metabolic syndrome (MS) and cardio metabolic risk factors like hypertension in various studies on epidemiology. Vitamin D insufficiency acts as a risk factor for blood flow in the vessels and subsequent incidents in the heart and veins (12-14).

In any case, the fact that this is an influential association has not been confirmed yet (4, 5). There is no evidence proving that low 25-hydroxyvitamin D (25[OH]D) accumulations are a noticeable effective risk factor or are just identified with unfavorable results due to retro causality and lurking factors like overweight, decreased mobility with low reception of sunlight, poor nourishment, or inflammation as of now (12).

Since hypertension has developed as the main risk factor for the worldwide sickness trouble, it is essential to assess if vitamin D beneficially affects bringing hypertension down to explain the probable role of vitamin D for general wellbeing.

This enhances the likelihood that vitamin D supplementary might be a straightforward intercession to lessen the blood pressure (5). However, the information from forthcoming, random experiments is inadequate.

Methods

The present study aimed to determine the relationship between hypertension and vitamin D. It obtained the approval from the Committee for Ethics in Medical Research associated with Mashhad University of Medical Sciences under the code IR.MUMS.MEDICAL.REC. 1397.346.

A case-control research was conducted concerning the secondary data (SINA system) among people, aged 30 years old or older, registered in 2017-2018. The data among general population covered by health system were gathered by Integrated Health Information System (SINA). At first, participants aged above 30 were checked by health care providers; the data were then recorded in the SINA system. The general evaluation included blood pressure measurement and consumption of maintenance dose of vitamin D each month. The BP was taken at least twice on each visit, with the measurements separated by five minutes. In case the systolic blood pressure (SBP) and/or DBP measurement was $\geq 140/90$ mmHg or the patient being under anti hypertension medication they would be diagnosed with HTN.

Criteria for including and excluding subjects

Populations were specified by means of purposeful sampling method. Criteria for including participants consisted of age over 30 with ability to visit health centers. They had no physical, mental and emotional disorder.

Criteria for excluded subjects involved inflammations in binding tissues like autoimmune diseases that can cause joint pain and damage throughout the body and long-term autoimmune diseases where the body's immune system becomes hyperactive and attacks normal, healthy tissues; long-lasting inflammatory disorders in lungs, liver, and kidneys; persistent infectious illnesses such as infectious bones; impairments in neoplasia; disorders of bone strength, namely insufficient and excessive production of the hormone thyroxine by the thyroid gland, outrageous glucose or sugar levels in blood, and interference with the body's normal recycling process; binge eating followed by purging; abnormally low body weight; experience of being pregnant and breast-feeding in the last year; and consumption of biologically active organic compounds with four rings arranged in a specific molecular configuration, antiepileptic drugs, anticoagulants that prevent the formation of blood clots, water pills to treat HBP and decline fluid accumulation in the body, lithium salts mainly consumed as psychiatric medication, drugs to impede the impacts of estrogen in women's breast tissue, medications to battle the bone density diseases, and other remedies influencing vitamin D absorption and Ca. Furthermore, participants with incomplete information or failure to visit comprehensive health service centers were excluded.

Methods of measurement

According the below formula, the sample size was estimated based on a study conducted in Iran. A sample size of 1,500 patients was used comprising of 500 patients with hypertension as the case group and 1,000 people without history of hypertension as the control group. The population was selected randomly. In this regard, alpha error of 5% and beta error of 20% were considered.

$$n = \frac{(z_{1-\alpha/2} + z_{1-\beta})^2 (p_1(1-p_1) + p_2(1-p_2))}{(p_1 - p_2)^2}$$

Statistics

Data were analysed using SPSS version 22. Subsequently, data were reported using descriptive statistics.

Having been mined, data were entered into SPSS v22 software. Descriptive statistics (dispersion and central indices) were calculated, followed by determining the frequency of HBP in the subjects screened by Mashhad University of Medical Sciences (MUMS) during 2017.

T-test or Mann-Whitney U Test was utilized to investigate the relationship between factors and blood pressure for analytical analysis after assess-

ing the normality of data. Pearson and Spearman correlation were used to examine the correlation between them. Also, the logistic regression model was used to control for confounding variables to determine the relationship of the independent variable with the categorized values of the dependent variables.

This present research obtained the approval of the Committee for Ethics in Medical Research associated with MUMS.

Results

The study included a total of 1,500 participants over 30 years old (49.7 ± 2.02). Table 1 shows participants' demographic information including age, gender, history of diabetes or cardiovascular disease, BMI, waist size and regular consumption of vitamin D. According to table 1, the majority of the participants were women. Additionally, no significant difference could be spotted between the two groups (p value=0.122) in terms of age. Table 2 illustrates the odds ratio and 95% confidence interval for the association between regular vitamin D absorption and high blood pressure.

Table 1. Demographic characteristics of participants

Parameter	Classification	Case		Control		P value
		mean \pm SD	%	mean \pm SD	%	
Age		58.9 \pm 15.6		59.23 \pm 16.27		0.122
Blood pressure	Systolic	127.12 \pm 24.58		112.13 \pm 26.15		
	Diastolic	76.7 \pm 83.69		68.8 \pm 71.73		
Sex	Male	32%	32%	40.3%	40.3%	0.004
	Female	67.4%	67.4%	59.7%	59.7%	
Diabetes		38%	38%	23%	23%	0.0001>
Cardio-vascular disease		11.6%		4.4%		0.0001>
BMI	BMI \leq 18.5	0.8%	0.8%	1.9%	1.9%	
	BMI 18.5-25	28%	28%	48.6%	48.6%	
	BMI $>$ 25	39.8%	39.8%	36%	36%	0.0001>
	BMI $>$ 30	31.4%	31.4%	13.5%	13.5%	0.0001>
Waist size $>$ 90 cm		58.8%		37.2%		0.0001>
Regular intake of vitamin D		31.1%	31.1%	41.9%	41.9%	

Table 2. Relationship between regular vitamin D intake and hypertension risk

Parameter	Classification	Raw odds ratio	P value
Regular intake of maintenance vitamin D	No	1	-
	Yes	0.46-0.625 (0.849)	P=0.003

The results depicted that the risk of hypertension was 37.5% lower with confidence interval (0.8-0.84%) than those without regular vitamin D intake and this relationship was statistically significant ($p=0.003$).

Discussion

Lower levels in circulating 25-hydroxyvitamin D [25(OH)D] are related with a greater chance of hypertension (HTN) (4). An extensive number of experiments indicate that deficiency in vitamin D can be a leading cause for cardiovascular disorders and mortality (14, 15). Some examinations uncover that incremented plasma accumulations of 25(OH)D may lessen the chance of hypertension (3, 16, 17). The present research reflects the impacts of maintenance intake of vitamin D on high blood pressure, which is an outstanding issue in preventive medication for Iranians (18). The findings were suggestive of the fact that if everyone ingested a regular portion of vitamin D (50,000 IU) on a monthly basis, they would less likely suffer from hypertension.

A dominant part of accessible data about the impact of vitamin D supplementary on both top and bottom reading is found to have no consistency. Although some studies delineate the advantages of standard ingestion of vitamin D, some have been unable to reach the same result (5, 13). Moreover, the fact that vitamin D supplements lessen BP and which patient attributes foresee a reaction is still unknown (13, 19-21). Alternatively, accessible data about the adequate ingestion of vitamin D shows that each 10% rise in genetically instrumented 25(OH)D accumulation was parallel to a -0.29 mm Hg difference in the bottom reading (-0.52 to -0.07; $p=0.01$), a -0.37 mm Hg difference in the top reading (-0.73 to 0.003; $p=0.052$), and an 8.1% diminished chances of high blood pressure (OR 0.92, 0.87-0.97; $p=0.002$) (17). In addition, some studies portray that high levels of plasma in vitamin D may be a sign of lower probability for hypertension (5). Furthermore, the other randomized trial control indicated that vitamin D supplementary had no positive impact on blood pressure or indicators of vascular wellbeing in older patients with isolated high top reading (12, 22-24). Vitamin D supplementary plays no role in bringing down BP and hence ought not to be utilized as a medication to prevent hypertension (13, 20).

The inconsistency between the past examinations and our discoveries can be credited to the succeeding reasons: first, past investigations have been carried out in various topographical locales with various hereditary histories and ethnic societies.

Second, the centerpiece of this investigation would be the expansive range of candidates who whether or not ingested a regular portion of vitamin D. The most important confinement in this examination was that the previous 25(OH)D serum level was not accessible on the grounds that we utilized secondary information (SINA system) which did not include this serum level for healthy people.

Conclusion

Considering a noteworthy commonness of deficiency in vitamin D among the Iranian populace (25), the noticeable message in this investigation is to notify the significance of receiving the regular portion of vitamin D in the general public as a defensive factor for HBP, as well as the necessity to make the proper arrangements.

Because of the restricted number of investigations in this regard, further subjective and controlled examination might be justified to specify the function of this agent in hypertension.

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Conflict of Interest

The authors declare no conflict of interest.

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