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Vitamin D3 And Calcium Levels In Serum Of Iraqi Elderly Parkinson's Patients

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Abstract

Objectives: Parkinson's disease (PD) represents a multi-part progressive neurodegenerative disease described by rigidity, bradykinesia and tremor in addition to postural unstable appearing of patients as the disease progress. The purpose of this study evaluate of some parameters (Ca^{+2}, Vitamin D, C, E and phosphorus) in sera of PD Iraqi patients. Methods: Two main groups were included in this study; 55 patients (22 male &23 female) with PD (patients group) and 30 (11male & 19 female) apparently healthy controls (control group) without a history of PD were involved in the current study. Results: Vitamin D in the sera of patient group was a highly significant decrease ($p<0.001$) in comparison to the control group while highly significant decrease ($p<0.001$) in the calcium levels of patient group, as well as highly significant decrease ($p<0.001$) in the phosphorus of patients group was observed in comparison with their levels in corresponding control gruop. Meanwhile, a significant decrease ($p<0.05$) in vitamin C of patients group when compared to that of control group and a highly significant decrease ($p<0.001$) in serum vitamin E concentration of patients group when compared to that of control group. Conclusion: The current study results show a deficiency in most antioxidant parameters [vitamin D_3, E, C and phosphorus] that may subsequently lead to their inability to suppress free radicals and thus lead to oxidative stress. This leads to relapse and the progression of patients' condition for the worse.

Key words: *Parkinson's disease, vitamin D_3, oxidative stress, calcium.*

INTRODUCTION

Parkinson's disease (PD) represents a multi-part progressive neurodegenerative disease describeي by rigidity, bradykinesia and tremor, in addition postural instability appearing of patients as the disease progress [1]. In addition to cardinal motor signs, several non-motor appearances are common, such as sensory symptoms (tingling, pain, hyposmia, depression, sleep disturbance, , and cognitive damage. The disease was first defined by the scientist James Parkinson in the year 1817 and further distinguished by the scientist Jean Martin Charcot, and our knowledge of PD continues to expand [1,2]. The pathological official marks of disease are the damage of dopaminergic neurons, most prominently in a certain parts of the basal ganglia (e.g., putamen, substantia nigra) and the aggregation of proteins to so-called Lewy bodies (LBs) in the remaining nerve cells [3]. The age is one of the strongest risk factor for PD. Although the highest patient with PD begin the disease at about 60 ages, however, there are 5 -10 percent of patients who develop the disease before 50 age. Early-start, forms of PD are often hereditary, and certain forms have been related to particular gene mutations [4]. The cause of PD is unknown, but there are some of genetic factors have been described, in addition to some of the genes which lead to unusual familial PD forms. The environmental influences, for example caffeine consumption, cigarette smoking and pesticide exposure have been assumed to modify the PD risk progress, while the role of this factors remains uncertain [1]. The motor symptoms of PD result from the cells death in the substantia nigra, area of the midbrain, leading to the dopamine insufficiency. The cause of this cell death is still ill understood, but includes the build-up of proteins into LBs in the neurons [5].

Vitamin D_3 is essential for keeping various physiologic roles, and the deficiency of vitamin D_3 is related to increase of PD risk. The optimum balance, muscle strength, and innate immunity need to acceptable levels of vitamin D_3; also vitamin D_3 deficiency is closely associated with many types of cancer, as well as cardiovascular and autoimmune conditions [6, 7, 8]. Vitamin D_3 has also linked with

a variety of neurologic illnesses, including neurodegenerative diseases, multiple sclerosis (MS), and stroke [9]. On neurology wards, opinions on vitamin D3 differ greatly from dismissal as the molecule-de-jour to needing to monitor of vitamin D3 for everyone. In the importance of well bone metabolism, there can be slight argument for substitute vitamin D3 in individual insufficient in this important nutrient [10].

MATERIALS AND METHODS

Two main groups were included in this study; 55 patients (22male &33female) with PD and 30 (11male &19female) apparently healthy controls comparable for age and gender without a history of PD were involved in the current study.. Then the samples was centrifuged at 3000xg for five minutes. The obtained serum samples were stored at (-20°C) for determining the studied parameters. The study protocol was permitted by the Ethics Committee of the Department of Science Chemistry, University of Al-Iraqia.

Serum vitamin D_3: Stored serum samples were investigated with enzyme-linked

Immunosorbent analyze kit for 25(OH) D by using Elisa human kit.

Serum calcium levels: serum calcium was calculated according to photometric method using human kit.

Vitamin C and E levels: Vitamin C and E levels were dictated by utilizing Elisa human kit was purchased from (Shanghai Yehua Biological Technology, Shanghai, China).

The data were analyzed utilizing SPSS program by by authorized materials rendition 20 PC programming. The data in this study were offered as (Mean± SD) using independent-samples t-test to compare mean. The range at ($p<0.05$) was accepted as significant, while it's a highly significant when ($p<0.001$).

RESULTS AND DISCUTION

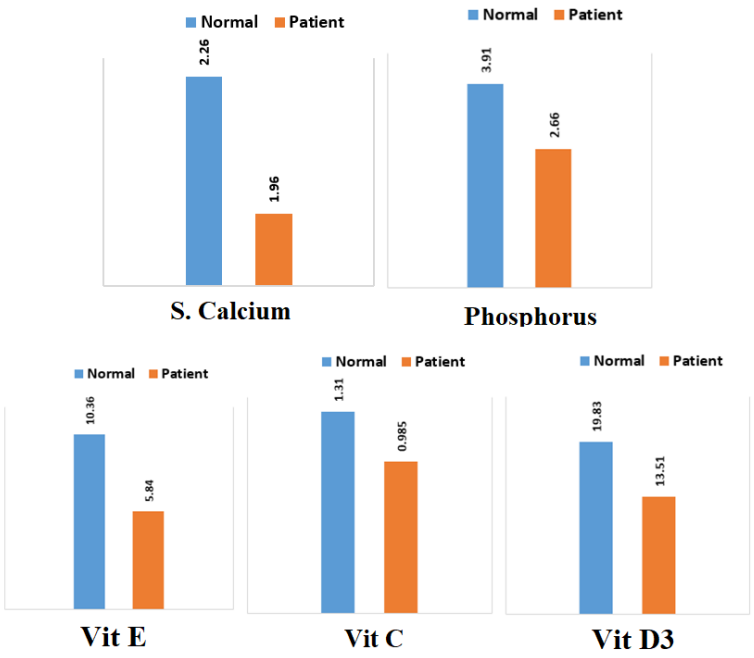
Vitamin D_3 in the serum of patients group was highly significant decrease ($p<0.001$) compared to the control group, while a highly significant decrease ($p<0.001$) in Ca^{+2} of patient group, as well as a highly significant decrease ($p<0.001$) in phosphorus of patients group was observed in comparison to their levels in the corresponding control group. A highly significant decrease ($p<0.001$) in serum vitamin E of patients group in comparison to that of the control group, as well as a significant decrease ($p<0.05$) in vitamin C of patients group when compared to that of control group. (Table 1) show the results of all studied parameters of patients group and control group.

Table 1: mean ± SD of vitamin D_3, C, E, Ca^{+2}, and phosphorus in serum of patients group and control group.

Parameters	Patient group	Control group	*p*-value
Vitamin D_3	13.51± 7.50	19.83± 7.09	P <0.001
Calcium	7.36 ± 1.05	8.29 ± 0.76	P <0.001
Phosphorus	2.66± 1.05	3.91± 1.07	P <0.001
Vitamin C	0.985± 0.653	1.31± 0.747	P <0.05
Vitamin E	5.84± 3.330	10.36± 4.746	P <0.05

The current study was in agreement with several authors for the vitamin D_3 levels in PD [11, 12, 13]. Vitamin D_3 plays a substantial role in Calcium (Ca^{+2}) homeostasis [14]. Vitamin D_3 insufficiency also predicts bigger risk of another prolonged condition such as cancer [15]. Recently, chronically insufficient vitamin D_3 consumption was recommended To play an important and central role in the PD pathogenesis [16]. According to the recommended biological mechanism, the cause of the disease may be attributed to a continuously insufficient vitamin D_3 status leading to a prolonged damage of dopaminergic neurons in the brain of human. The epidemiological sign of an association between PD and vitamin D_3 is, however, limited to several studies showing lesser vitamin D_3 in PD patients compared with healthy persons [11-17,18]. Vitamin D_3 insufficiency is common among persons living with PD. The deficiency of vitamin D_3 was widespread at all ages, particularly in elderly people. Vitamin D_3 not only regulate Ca^{+2} homeostasis and bone health, but too regulate the pathological and physiological processes, like cell proliferation, cell differentiation, antioxidative stress, and immunomodulatory [19].

Figure 1: Comparison between patients group and control group of vitamin D_3, C, E, Ca^{+2}, and phosphorus in serum.



The cells use Ca^{+2} to adapt to ever-changing environmental conditions. In multi-cellular organisms, Ca^{+2} play essential roles throughout fertilization and development. When the cells failure to regulate Ca^{2+}, this lead to pathological situations, which ends with cell death [20]. The electrical activity of excitatory and neurons cells depends on different kinds of ion channels with electrical potential and ligand permeable to inorganic ions, for example Na^+, K^+, and Cl^-. L-type (also known as Cav1 family) voltage-gated Ca^{2+} channels, Cav1.2 and Cav1.3, have been implicated in PD [21]. Ca2+ ion gradient through cells is kept by the active extrusion of Ca2+ to the extracellular space by the plasma membrane Ca2+-ATPase force and the Na+/Ca2+ interchange, or sequestration into intracellular organelle stores by the sarco-endoplasmic reticulum ATPase pump. The Ca2+ siphoning needs to a great extent more energy than interchange of Na+ or K+ [22]. There are many assertions that any abnormalities in the regulation of Ca^{+2} balance play a significant role in PD pathogenesis. The Ca2+ pathway crosses with mitochondrial work and oxidative stress the two of which are engaged with the PD pathogenesis. More recently it became clear that the Ca^{2+} regulation also cooperates with function of endoplasmic reticulum

and unfolded protein response [23]. Vitamin D_3 deficiency and Ca^{2+} disturbance were more communal in patients with PD than in healthy people, this may be as a consequence of the chronic disease or the decreased of portability adds to these unsettling influences[24].

Phosphorus is the main intracellular element in mammals. The entire phosphorus in the body of a 70-kg is nearly 700 to 800 mg, 85 percent of which are in skeleton in hydroxyapatite phase; the residual 15 percent found in the soft tissues. Almost all of the phosphorus found in extracellular fluid space is in the phosphate form [25].

Vitamin C is additional important water-soluble vitamin generally distributed in several tissues. It is rich in vegetables, animal livers, and fruits. Vitamin C includes two molecular sub forms: ascorbic acid and dehydroascorbic acid. Vitamin C deficiency is communal, particularly in the children and elderly. It is significant for the physiological role of the cells of the nervous system just as its function as an antioxidant by forestalling oxidative stress, expulsion free radicals, and forestalling lipid peroxidation [26]. The products of oxidative stress can be generated from dopamine metabolism, which in return make accumulation of irregular proteins in PD [27]. Vitamin C has the potential to treat PD, depending on the subsequent reasons. Firstly, It is widely distributed in the regions that contain a lot of nerve cells [28]. Secondly, it can be transferred to the brain via vitamin C transporter type 2 (SVCT2) [29]. , and DHA can be transferred to the brain via glucose transporter type 1 (GLUT1) and glucose transporter type 3 (GLUT3) [30]. The connection between vitamin C and PD has been portrayed in various investigations, and sickness danger can be diminished by burning-through more dietary vitamin C [31, 32, 33].

Vitamin E is one of the fat-soluble vitamins that has significant antioxidant roles, Furthermore, it is involved in various physiological processes, for example, immune function [34], physical performance, cognitive function [35], and control of gene expression. In human body vitamin E deficiency is clinically characterized by ataxia, anemia, and peripheral neuropathy [36, 37]. The defensive parts of Vitamin E are basically accomplished by forestalling oxidative pressure and forestalling apoptosis in cells [38]. Nonetheless, a large-group, community-based study revealed that the high dietary vitamin E consumption of approximately 10 mg / day may decrease the risk of developing PD [39].

Oxidative stress has a critical and significant part in the PD pathogenesis by means of degeneration of dopaminergic neurons. Disturbances in the physiology to maintain redox in neurons interfere with many other biological processes, and this ultimately leads to cell death [40]. In the brain, reactive oxygen species can be producing from several sources, in glia and neurons cells, with the electron transport chain being key contributor at mitochondrial level [41]. Other sources of ROS include NADPH oxidase (NOX), monoamine oxidase (MAO), and other flavo-enzymes with NO, which are abundantly present in the brain due to the presence of NOS [42]. Dopamine can be described as an unstable molecule that can undergo auto-oxidation to form free radical and dopamine quinones [43].

CONCLUSION

The current study results indicate a deficiency in antioxidants [vitamin D, C, E and phosphorus] that may subsequently lead to their inability to suppress free radicals and thus lead to oxidative stress. This leads to relapse and the progression of patients' condition for the worse.

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