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A CROSS-SECTIONAL STUDY TO DETEMINE THE EFFECTS OF VITMAIN ''D'' DEFICIENCY ON HUMAN BODY

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Abstract:
Objectives: *To study deficiency of vitamin "D" and its effects on human body.*
Material & Methods: *The study was conducted in a local private clinic situated in HML Hospital Lahore from January 2019 to March 2019. Five hundred subjects were included in the sample which consisted of 250 males and 250 females. These subjects presented to the hospital due to any major or minor illness. These subjects also included those who had or had no body aches. Samples of blood were also collected from these patients by venipuncture by disposable syringe after overnight fasting in mooring. 4 ml of blood sample was taken which was stored at -18°C till the time the sample was analyzed. The variables which were studied are age, gender, serum levels of vitamin "D", serum calcium levels and past history of any pain in bones. SPSS-version-10 for windows was used to analyze the study. P value of <0.05 was considered to be significant statistically.*
Results: *In 75.5% of the patients included in sample had vitamin "D" deficiency, 9.5% of them were having levels of vitamin "D" within normal range while 15% among the sample patients were in the category of vitamin "D" insufficiency. There was a prevalence of 90.5% of vitamin "D" deficiency and insufficiency overall. 163 (32.6%) patients were presented with the complaints of body aches while remaining 337 (67.4%) patients were having no complaints of body aches. Serum calcium levels were in normal range in all patients which were included in the sample.*
Conclusion: *The dietary insufficiency and lack of exposure to sunlight being the major causes of vitamin D deficiency in humans.*
Key Words: *Vitamin ''D'' deficiency, Risk factors.*

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INTRODUCTION:

The main source (80 %) of vitamin "D" is sunlight which results in synthesis of vitamin "D" from cholesterol [1]. Sufficient amount of vitamin "D" can also be obtained from dietary sources which includes oily fish, milk, egg, and butter.1 Vitamin "D" that is formed in skin as a result of sunlight exposure or obtained from diet is biologically inactive, its activation requires hydroxylation in liver and kidney. The two important compounds of vitamin "D" are vitamin D3 (Cholecalciferol) and vitamin D2 (Ergocalciferol). The first hydroxylation of vitamin "D" occurs inn liver which results in conversion of vitamin "D" (chole-calciferol) to calcidiol (calcifediol) [2]. Measurement of serum levels of calcidiol can be helpful in assessing the vitamin "D" status of a person. Biologically active form of vitamin "D" is calcitriol which is formed in kidneys from conversion of calcidiol. Calcitriol is released from kidneys and it circulates in blood as a hormone. It regulates the levels of calcium and phosphorus in bloodstream. Calcitriol also functions to promote the remodeling of bones, immune system and neuromuscular junction. Deficiency of vitamin "D" is a common problem in people of Pakistan. The drastic consequences of vitamin "D" deficiency includes the following: Osteoporosis, Fatigue, Muscle pain, Fractures, Depression, Malignancies of colon, prostate, breast and ovary, few of non-specific symptoms can also result to due mild deficiency of vitamin D. [3]

The contribution of skin pigmentation is negligible to reduce formation of vitamin "D" from sunlight. The main causes of vitamin "D" deficiency includes lack of sunshine [4], inadequate dietary intake as occurs in cases of malnutrition. [5]. Vitamin D deficiency can also cause increase production of parathyroid hormone by the parathyroid glands which effects the skeletal system and can even cause fractures [6]. Because lower vitamin "D" levels is the risk factor for many diseases, the main objective of this study was to test the hypothesis that vitamin "D" deficiency was prevalent in asymptomatic adults who were healthy apparently.

MATERIAL AND METHODS:

A cross-sectional multicenter study was carried out in a local private HML Hospital Lahore from January 2019 to March 2019. This study was performed on 500 patients including 250 males and 250 females coming from rural and urban areas having different socioeconomic status. Age group of patients was in between 20 to 80 years. Majority of them were married, living in houses. As per reported by the subjects, they were exposed to sunlight for 1-2 hours per day.

Majority of them were having complaints of body aches while some of them had no body aches. A questionnaire was handed over to the subjects to determine their age, gender, occupation, time duration of exposure to sunlight, clothing and dietary habits. Blood samples were drawn out after overnight fasting in morning by means of disposable syringes through venipuncture. Centrifugation of blood samples was carried out 2 hours after venipuncture in order to separate serum, which was collected and preserved in tubes at a temperature of -18°C till the time they were analyzed.

SPSS-Version-10 for windows was used to analyze the study. The variables studied were age, gender, serum levels of vitamin "D", serum calcium levels and past history of any body aches between pain and serum levels of vitamin "D". The values of vitamin D levels in the body is shown in Table 2.

DISCUSSION:

According to many studies, the prevalence of vitamin "D" deficiency is higher in Asian population.3-11 Vitamin "D" deficiency is a common problem worldwide. People of all age groups either males or females can suffer from vitamin "D" deficiency. Vitamin "D" is formed in skin by sunlight which results in conversion of cholesterol to vitamin "D". Vitamin "D" can also be obtained by means of diet. This vitamin "D" formed in skin and obtained from diet is in inactive form. It is activated by passing through enzymatic hydroxylation in liver and kidney. Activated vitamin "D" causes intestinal absorption of calcium, it also causes mineralization of bones, thus deficiency of vitamin "D" can affect the skeletal system widely. Other than diseases of bones, vitamin "D" deficiency can also cause wide range of other diseases like type 1 Diabetes, Rheumatoid arthritis, disorders of immune system and certain malignancies.7-9

Table 1: Relationship of body aches with age

Age (years)	Bones or body aches		Total
	Present	Not present	
<20	19	52	71
21-40	84	241	325
41-60	38	41	79
61-80	19	19	3
>80	3	0	3
Total	163	337	500

Table 2: Levels of vitamin D in human body

Vitamin D status	Vitamin D levels
Vitamin D deficiency	Less than 20 ng/ml
Vitamin D insufficiency	21-29 ng/ml
Normal range of vitamin D	30 ng/ml to 153 ng/ml
Vitamin D intoxication	Greater than 153 ng/ml

There is also a correlation between vitamin "D" deficiency and occurrence of Tuberculosis. Previously, it was thought that tuberculosis might be an effect of vitamin "D" deficiency but recent studies has shown that vitamin "D" deficiency is a cause of tuberculosis.10 Researches has also proved that chronic diseases such as depression, high blood pressure, schizophrenia, multiple sclerosis are also linked to vitamin "D" deficiency.11,12 Symptoms are not common in mild deficiency of vitamin "D". Severe deficiency of vitamin "D" is indicated if symptoms are present. These symptoms includes osteoporosis, body aches, fracture of long bones, lethargy and muscle pain. In local people, the main cause of vitamin "D" deficiency is avoidance of sun exposure. This may be due to the fear that sun exposure could result in darkening of complexion. Another main factor that also contributes to vitamin "D" deficiency is covering of whole body religiously except hands and face while outdoor especially in females thus avoidance of sun exposure, these findings differ from the studies done in rest of the world13-15. There is a misconception among people regarding harmful effects of sunlight due to which they avoid exposure to sunlight. In study population, it was found that the main determinant of serum vitamin "D" levels was sunlight exposure. Area of skin exposed to sunlight and duration of exposure are also strongly correlated. Another contributing factor that results in hypovitaminosis "D" in Pakistan is that dark skin requires greater exposure to sunlight to produce vitamin "D" as compared to less pigmented skin, this is in consistent with the studies done at South Africa.16-19

Another important determinant among study population was diet because most of our study population having deficiency of vitamin "D" were consuming lower amount of food rich in vitamin "D". Also because in Pakistan there is no fortification of food with vitamin "D" and no supplementation of vitamin "D" these factors are also contributing to vitamin "D" deficiency among study subjects. In a study by Saraiva GL and Robina et al the dietry deficiency was not the main cause of Hypovitaminosis20-22.

Limited exposure to sunlight was found to be the main contributing factor. In females the covering of whole body except hands and face while outdoor also caused avoidance of sun exposure and hence causes lack of vitamin "D".

RESULTS:

Results of the study are as under. Age of the subjects ranged between 20 and 80 years. Among 500 subjects, 250 (50%) were males and 250 (50%) were females.

Predominantly the subjects were married. Among these, 71 (14.2%) subjects were below the age of 20 years, 325 (65%) were having age in between 20-40 years, 79 (15.8%) were between 41-60 years, 22 (4.4%) were between the age of 61-80 years and 3 (0.8%) were above the age of 80.

According to the results, 75.5% of the sample patients showed deficiency of vitamin "D", 15% among the sample patients were vitamin "D" insufficient while 9.5% of them were having serum levels of vitamin "D" in normal range. There was a prevalence of 90.5% of vitamin "D" deficiency and insufficiency overall. One hundred & sixty-three of the sample patients were complaining of bones or body aches while most of the subject i.e 337 were having not any complaints of bones or body aches (Table 1). It was also found that there was not any significant relationship between pain and serum levels of vitamin "D". The values of vitamin D levels in the body is shown in Table 2.

CONCLUSION:

Deficiency of vitamin "D" is a major public health problem. Serum levels of vitamin D3 are often measured in causes which are presented with different signs and symptoms where establishing a diagnosis is found to be difficult. Because vitamin "D" is formed in skin from sunlight exposure hence a major cause of vitamin "D" deficiency is lack of exposure to sunlight.

Recommendation:

Awareness should be created among people to increase sub exposure and this can be made possible through health education. Also emphasis should be made on supplementation as well as screening of vitamin "D" to decrease its ill effects on health.

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