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Research Article

An Investigation into Phenomena of Vitamin D Status and its Association with Different Bio-Chemical Parameters: Pakistani Population Based Study

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ABSTRACT

Background: Vitamin D deficiency is related to substandard health. The frequency of vitamin D deficiency may be rising, however populace based patterns are uncertain.

Objective: This study was conducted to investigate the status of vitamin D level and its association with biochemical parameters like Uric Acid, LDH, ALP, SGPT, SGOT, total bilirubin, urea, creatinine, calcium, cholesterol, triglycerides, LDL, HDL, sugar in our healthy population.

Materials and method: The study was the analytically observational. A total of 271 healthy subjects was randomly included (male and female) that came to examine the basic medical checkup in MINAR cancer hospital. Biochemistry parameters were analyzed on Chemistry Analyzer by Merck. The enhanced chemiluminescent immunometeric technique was applied to measure vitamin D level in the subjects.

Results: Vitamin D deficiency was investigated more in females (84.8%) as compared to males (62.8%) with significant variation (p=0.000) and in age group 1-26 years as compared to other age groups with significant variation (p=0.008). The weak negative correlation of vitamin D level with uric acid (p=0.031, r=-0.156) in the whole population was observed. No significant correlation was found between vitamin D level and other biochemical parameters ALP, SGPT, SGOT, total bilirubin, cholesterol, triglyceride, LDL, HDL, creatinine, urea, sugar, LDH.

Conclusion: The deficiency of vitamin D level was high in female (84.8%) in gender and 1-26 years (82%) in age groups of southern Punjab inhabitants. Significant week negative correlation of vitamin D level with uric acid was also investigated.

Keywords: Vitamin D; Prevalence; General population; Biochemistry parameters; Association

INTRODUCTION

Vitamin D belongs to the group of the fat-soluble molecules, andit has structural resemblance with steroids which considered as seco-steroides contain "broken ring" (seco is Greek word, whose means to break) [1].

Vitamin D also plays an important role in bone health and its severe deficiency in bones causes bone-malformation in children's that is known as rickets, and their milder range of insufficiency are considered to cause reduced an efficiency to utilize the dietary calcium [2]. Vitamin D deficiency also causes muscle weakness in old aged that has been considered a very dangerous effect of vitamin D on muscle function.

The major function of 1-25OHD is in calcium homeostasis. Moving in the body calcium levels is fixed regulated via the effects of calciotropic hormone systems including vitamin D and PTH. 1-25OHD improves construction and activation of the TRPV-6 ion channel and calcium binding protein in the intestinal epithelium to enhance the gut digestion of calcium. In the existence of low blood calcium, 1-25OHD and PTH step jointly to activate calcium from the body skeleton through activating osteoclast genesis and both increase distal renal tubule re-absorption of calcium [3].

Global occurrence of nutrition D deficiency for one billion humans and the state of affairs is extra insecure in developing nations of South Asia. Among resource restricted South Asian societies, Pakistan occupies a bigger proportion of vitamin D deficient population further to India in which poverty and malnutrition maintain to succeed and exacerbate the magnitude of vitamin

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D deficiency. Vitamin D deficiency remains to be overlooked in Pakistan as a difficulty of public health importance for some of the motives critical being limited dietary intake of diet, improper introduction to daylight for preserving superior degrees of 25(OH)D in tandem with numerous socio-cultural and monetary determinants [4].

Nearly all population subgroups from newborns to aged human beings along with pregnant ladies in Pakistan are seriously deficient in the vitamin D in spite of plentiful sunshine because of its geological position [5]. Some of the studies of varying sizes had been beneath taken in Pakistan to evaluate vitamin D status there does present a lack of published data at the quantity of vitamin D deficiency throughout all age corporations, genders, income population and dwellings, e.g. city and rural place [6].

Pakistan lacks a particular and flourishing health care infrastructure which consequents upon severe health and financial losses. The disease trouble and mortality rate correlated with malnutrition among an expansion of population crowed seemingly continue to be unaffected in the final several years. Nutritional wellness of Pakistani populace has never been a concern of the authorities, enterprise and the worldwide organizations and efforts underway to solve vitamin D deficiency have not yet been efficient to mitigate the gravity of the problem. Terrible monitoring and surveillance to identify and quantify the crisis of vitamin D deficiency have no longer been a part of any dietary program in Pakistan. In the above light of reference, we investigated the vitamin D deficiency and its correlation with biochemical parameters in the healthy population of Pakistan.

MATERIALS AND METHOD

Aim and objectives

RIA (Radio Immune Assay) and biochemistry laboratories of MINAR, Multan are very active in our oncology and nuclear medicine departments where hundreds of blood samples are analyzed daily basis. Therefore, it was needed to find out how much deficiency is become in our healthy individuals and have any correlation with biochemistry parameters. Because mostly population does not take the sunshine, do their working under the roof over the years and never conscious in diet especially for the vitamin D. The deficiency of the vitamin D is a very serious issue in our individuals. The aim of the study was to investigate the vitamin D level and its correlation with biochemistry parameters in the population of southern Punjab Pakistan.

Subject

A total of 271 healthy subjects was randomly included (male and female) that came to basic medical checkup (biochemistry parameters and vitamin D level) in MINAR, Nishtar Hospital and Medical University, Multan during July 2017 to July 2018. The mean age of the subject was 45.70 ± 14.26 (mean ± SD). Clinically normal individuals were included into the study.

Study Area

The study was carried out at Multan Institute of nuclear medicine and oncology which is situated in the heart of Multan City and provides hormonal and clinical investigation facilities to southern districts of Punjab Pakistan over the population of 22,278,844 in censes 2017. The geographical location of Multan is latitude 30°9' 26.848"N, longitude 71°31' 29.694"E and 129 meters high from sea level. Its weather is mostly hot and arid [7].

Blood Sampling

Samples were collected from each subject by professional Phlebotomists with appropriate safety measures to avoid the contamination, following the guideline International Standard by Clinical Laboratory Standard Institute and WADA [8]. Blood was drawn by venipunture with BD syringes precision Glide Needle 23 G 1 TW (0.5 mm × 25 mm), (Becton, Dickinson Company, Made in Singapore) directly to BD, Red top vacutainer (5.4 mg, 3.0 ml, Becton Drive, Franklin Lakes. The sample was centrifuged at three thousand rpm on automatic temperature control machine (Hitachi, Japan) for five minutes for serum collection (from clotted blood).

Statistical Analysis

The statistical analysis was conducted in IBM, SPSS-24. Chi square test was applied for nominal data to investigate the prevalence. The Pearson and Spearman correlation test was applied to check the association between vitamin D level and biochemistry parameters after the investigation of normal/non-normal distribution by the D'Agostino Pearson test. P-Value<0.05 was considered for significance.

Laboratory analysis

Biochemistry parameters were analyzed on Junior Selectra by Merck and vitamin D level was measured on COBAS Machine (chemilumiscent immunometeric technique) in sera of the subjects. Before analyzing the serum specimens, standard calibrators and control reference standard was performed under the protocol given by the manufactures on daily basis.

RESULTS

In our results, males were 132 (48.71%) and females were 139 (51.29%). The mean age of the individuals was 45.7 ± 14.26 year. Vitamin D deficiency was investigated more in females (84.8%) as compared to males (62.8%) with significant variation (p=0.000035) as showed in Table 1.

Table 1: Prevalence (%) of vitamin-D deficiency in males Vs females.

Gender	Subjects (No)	Vitamin D (deficiency) <30 ng/ml	Vitamin D (sufficient) 30-100 ng/ml
Male	132	83(62.8%)	49(37.12)
Female	139	118(84.8%)	21(15.1)
P value	0.0000		

Deficiency level of the vitamin D was investigated more in 1-26 years (82.6%) as compared to 27-52 years (70.5%) and 53-78 years (53.84%) with significant variation (p=0.0082) as shown in Table 2.

Table 2: Prevalence (%) of vitamin-D deficiency in age groups.

Age Group	Subjects (No.)	Vitamin D (deficiency) <30 ng/ml	Vitamin D (sufficient) 30-100 ng/ml
1-26 years	23	19(82.6 %)	4(17.3)
27-52Years	170	120(70.5 %)	50(29.4)
53-78 years	78	42(53.84 %)	36(46.5)
P value	p=0.0082		

Weak negative correlation of vitamin D level with uric acid (p=0.031, r=-0.156) in whole population was observed. No significant correlation was observed between the vitamin D level and LDH, ALP, SGPT, SGOT, total bilirubin, urea, creatinine, cholesterol, triglycerides, LDL, HDL shown in Table 3. No significant correlation was also found with calcium and sugar (fasting and random).

Table 3: Comprehensive results of correlation b/w the biochemistry parameters with vitamin D levels.

Parameters	Samples (No.)	Mean age	Mean ± SD (Biochemical parameters)	Mean ± SD [b] (Vitamin D)	Correlation R-value	°P- value
[b]Alkaline Phosphate	220	46.06 ± 14	253.44 ±129.66	26.43 ±29.23	0.006	0.923
[b]ALT/SGPT	226	46.09 ±14	29.39 ± 18.92	26.31 ±28.93	0.003	0.956
[b]AST/SGOT	224	46.08 ±14	25.13 ±25.42	26.28 ±29.05	-0.008	0.901
[b]Total Bilirubin	222	46.13 ±14	0.70 ± 0.22	27.28 ±32.53	0.008	0.903
[b]Blood Urea	234	40.80 ±14	27.61 ± 11.23	27.43 ±28.53	0.106	0.103
[b]Creatinine	236	45.90 ±14	0.85 ± 0.45	25.47 ±28.42	-0.067	0.302
[b]Calcium	111	43.10 ±15	9.79 ± 2.24	29.11 ±36.36	-0.077	0.418
[a]Uric Acid	190	46.66 ±13	5.59 ± 1.47	26.68 ±35.63	-0.156	0.031*
[a]LDH	69	47.27 ±13	340.23 ± 99.36	22.06 ±23.41	-0.076	0.533
[b]FBS	139	47.01 ±14	114.53 ± 48.45	29.61 ±36.00	-0.040	0.635
[b]RBS	101	45.75 ±14	149.68 ± 87.78	26.26 ±28.11	-0.007	0.941
[a]Cholesterol	268	26.79 ±31	182.23 ± 40.0	26.79 ±31.92	-0.007	0.897
[b]Triglycerides	268	26.72 ± 31	172.01 ± 86	26.72 ± 31.95	-0.038	0.532
[a]LDL	241	25.91 ± 32	117.55 ± 41.19	25.91 ± 32.55	-0.025	0.695
[b]HDL	248	41.98 ± 34	26.43 ± 32.48	26.43 ± 32.48	0.078	0.217

Note: [a]-Normal Distribution, [b]-Non-Normal Distribution, *-significant result, °P-value was calculated by Spearman.

DISCUSSION

Vitamin D has a countless biological effects in additional to its conventionally functional related in body metabolism, bone health, muscles strength, and immune function and cardiovascular. Deficiency of vitamin D level has become a new global epidemic among both children and adults.

Our study show that occurrence of vitamin D deficiency level is more in women (84.8%) than men (62.8%) and 1-26 years (82.6%) old is more deficient than 27-52 years (70.5%) and 53-78 years (53.84%).

The study done by Bischoff et al. shows deficiency of vitamin D level is more common in the age but more so in women than in man. However, our finding shows an inequality of vitamin D deficiency in subjects between two different genders and ages. The study done by Jadoon states that no significant differences were observed in the levels of the vitamin D deficiency with respect to gender and age groups. This conflicts with our study. This study was conducted in patients with body aches and pain where as our study consisted in healthy individuals.

Correlation between LFT (ALP, SGPT, SGOT and total bilirubin) and vitamin D was not observed in our study results as shown in Figure 1. Study done by Skaaby in the general population demonstrated vitamin D status was inversely associated with incident liver disease. The risk of having a high level of LFT tended to be higher for lower the vitamin D with not significantly. Vitamin D deficiency is frequently present in chronic liver disease and may predict non-response to antiviral therapy in chronic hepatitis C [9-10].

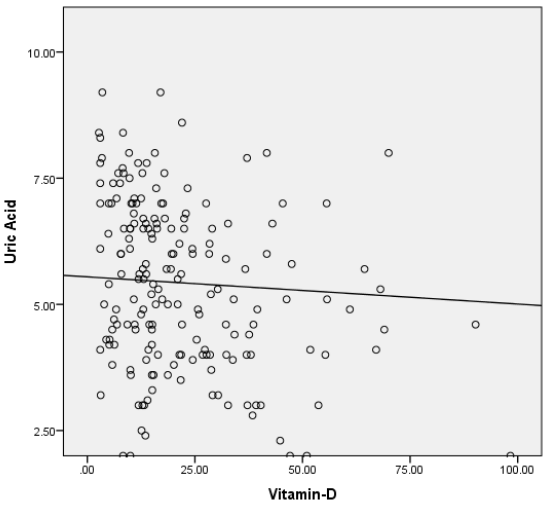

Figure 1: Correlation of vitamin D with uric acid in all subjects (both female and male)
impression: Weak negative correlation of vitamin-D (ng/ml) with uric acid (mg/dl) values.

In our study findings, there was no significant correlation found between the fasting sugar (P=0.63, r=-0.040) and random sugar (P=0.941, r=-0.007) with vitamin D. In other recent investigated studies result show there is weak positive correlation in diabetes type-2 patients. Serum vitamin D predicts insulin resistance in individuals with prediabetes. Early creature studies showed reduced secretion of insulin in response to glucose in vitamin D deficient patients. The study observed that vitamin D deficiency was common among individuals with prediabetes. However, the

relation of vitamin D status with insulin resistance has not been well studied among individuals with prediabetes [11] .Our study results show there is no significant correlation between vitamin D and lipid profile such as vitamin D and cholesterol (r=-0.007, P=0.897), vitamin D and Triglycerides (r=-0.038, P=0.532) vitamin D and LDL (r=-0.025, P=0.695), vitamin D and HDL (r=0.078, P=0.217). The study done, that the positive effect on lipid profiles has been suggested for vitamin D, but it is not apparent whether or not the helpful possessions of vitamin D are due to the hormone itself or its relationship with lipid profile metabolism. Another study also investigated negative correlation of vitamin D with Low Density Lipoprotein (LDL) and Triglyceride (TG) level [12-13].

However, vitamin D has now recognized as important for cardiovascular health and its deficiency as potential risk factor for several cardiovascular disease processes. Cardiovascular Disease (CVD) risk factors are also related with low concentrations vitamin D but clinical trial findings are inconsistent investigated that there was not found correlation between vitamin D and lipid profiles [14-17]. They were also found significant relationship with some lipid profiles during the two seasons (winter and summer) based on gender. Low vitamin D levels and bone disease are well-recognized complications of cholestasis liver disease, which decreases the production or flow of bile. More recently, studies have confirmed low vitamin D levels in non-cholestasis liver disease [18].

In our study results, significant week negative correlation was investigated between vitamin D and uric acid (r=-0.156, P=0.031) as shown in Table 3. According to Lin there are several possible mechanisms that may explain the association between uric acid level and bone health. Uric acid may be concerned directly in the pathogenesis of osteoporosis because of its antioxidant properties. Nabipour found significant negative correlation between serum uric acid and 1, 25(OH) 2D3 levels, but this correlation was lost with further adjustment in GFR. Another study done by Peng demonstrated that vitamin D insufficiency was significantly associated with uric acid among postmenopausal Chinese Han women whereas does not significant correlation in premenopausal women [19-21].

There was no significant correlation observed between the serum vitamin D and calcium in our study as shown in Table 3. The studies done by Paul Lips showed interaction exist between calcium and vitamin D to intake supplements [22].

Conclusion

Our study showed a higher percentage of deficiency in Vitamin D level in our population. The frequency of vitamin D level was high in female (84.8%) in gender and 1-25 years (82%) in age group of southern Punjab inhabitants. Significant week negative correlation of vitamin D level with uric acid was also investigated. No significant correlation found between vitamin D levels and other biochemical parameters (ALP, SGPT, SGOT, total bilirubin, cholesterol, triglyceride, LDL, HDL, creatinine, urea, sugar, LDH). Immediate precautions and steps should take to solve this public health problem. Our government should give supplements in fee of cost in hospitals so that the deficiency of vitamin D level in our population may be fulfilling the human body requirements.

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