Vitamin D Deficiency in Costa Rica: Initial Report on a Case-Control Study

Chen-Ku Chih Hao MD[1], Jimenez-Navarrette Manuel MD[2], Ulate-Oviedo Laura MD[2]
1. Attending Physician, Endocrinology Department, Hospital San Juan de Dios, San Jose, Costa Rica. 2 Endocrinology Fellows, University of Costa Rica. Contact information: chenku@racsa.co.cr

Abstract

Objectives: To describe, for the first time, clinical characteristics of patients with vitamin D deficiency in Costa Rica
Materials and methods: 17 patients with low levels of vitamin D (<30 ng/ml) were selected from the laboratory reports at the Hospital San Juan de Dios. 15 controls were selected with normal vitamin D levels and the same age and gender.
Results: There was no difference in age (52.76±20.88 years in cases vs 46.33±12.50 in control), gender (58.85% cases were females vs 80% in controls) or ethnic background (almost all patients were Hispanic). Mean vitamin D levels in cases was 23,71 ± 4,15 ng/dl. PTH levels were higher in cases (146.86±103.76 vs 47.82±13.77 ng/ml in controls, p=0.004). There was no difference in calcium levels (8.98 –cases- vs -9.38- mg/dl controls p=.352), phosphorus (4.09 –cases- vs 2.99 mg/dl –control- p=.104). BMD at hip and lumbar spine were comparable. There was no difference in the prevalence of nephrotic syndrome, chronic liver failure, chronic renal disease and sun blockers use between both groups. Neither group had patients in nursing homes. Subjects in the case group had 0.6 hours of sun exposure average per week compared with 1.46 in the control group (p=0.297). In the cases group, we observed a higher prevalence of falls (23.5% vs 6.7% p=0.039), fractures (17.6% vs 0%, p=0.024), diabetes (17.6% vs 6.7% p=0,158), fatigue (29.4% vs 13.3% p=0.012), weakness (41.2% vs 33% p=0.010), and use of inducers of cytochrome P450 pathway (29.3% vs 0% p=0.009). Body weight was lower in cases (26.6% with overweight or obesity vs 66.7% p=0.009).
Conclusions: Vitamin D deficiency may present even in tropical countries such as Costa Rica. It is characterized by high levels of PTH, a low body weight, high number of falls and fractures, fatigue, weakness and diabetes and associated with use of inducers of liver enzymatic activity. Both groups had a low sun exposure.

Introduction

Vitamin D deficiency is recognized as a worldwide problem although there are geographical differences on its prevalence. In places with a marked sun exposure variation, the vitamin D levels also varies.
Costa Rica is a tropical country located in Central America. Sun exposure is abundant all year round. However, as skin cancer awareness increases, solar exposure has been reduced by the use of protective measures. Also, as population ages, the dietary intake of vitamin D decreases. As its physical activity diminishes, it parallels the reduction in sun exposure. Therefore, it is not unexpected to find vitamin D deficiency in our country although this has not been reported previously.
Vitamin D deficiency causes osteopenia and osteoporosis. However, over the last few years, extraskeletal involvement has been recognized. It has been related to an increase in cancer risk, type 1 diabetes, multiple sclerosis, rheumatoid arthritis, and hypertension (Holick 2008). Data from NHANES III showed an increase in total mortality when vitamin D levels are under 17.8 ng/ml (Michos 2007).
Up to the moment, the Nuclear Medicine Hormone Laboratory at our hospital is the only center in the Social Security System – covering 95% of Costaricans – that measures 25-OH vitamin D levels, starting on 2007.
We present the first 17 cases of vitamin D deficiency defined as levels less than 30 ng/ml.
The main objective of the present study is to describe, for the first time, the clinical characteristics of patients with Vitamin D deficiency in Costa Rica.

Materials and methods

In 2007, we started measuring vitamin D levels for the first time at the Hospital San Juan de Dios in Costa Rica. We are the only laboratory in our Social Security system that is doing this at this moment. Vitamin D deficiency was defined as levels below 30 ng/ml. We selected 17 consecutive patients with vitamin D deficiency and 15 controls with normal vitamin D levels. Charts from cases and controls were reviewed and we collected data regarding demographic and clinical characteristics such as fractures, diabetes, cardiovascular disease history and prior medication use. We phoned the patients to ask them about weekly sun exposure average, previous use of sun blockers and other associated symptoms.
Statistical analysis was performed using SPSS 15.0. Continuous variables were analyzed using the T-test and the categorical variables using the chi square test.

Results

17 cases were identified and 15 controls were selected. Average age in cases was 52,76±20,88 and 46,33±12,50 years in controls (p=0.307). 58.8% of cases and 80% of controls (p=0.265) were women. Mean vitamin D level in cases was 23,71±4,15 ng/dl

Clinical manifestations of cases with vitamin D deficiency

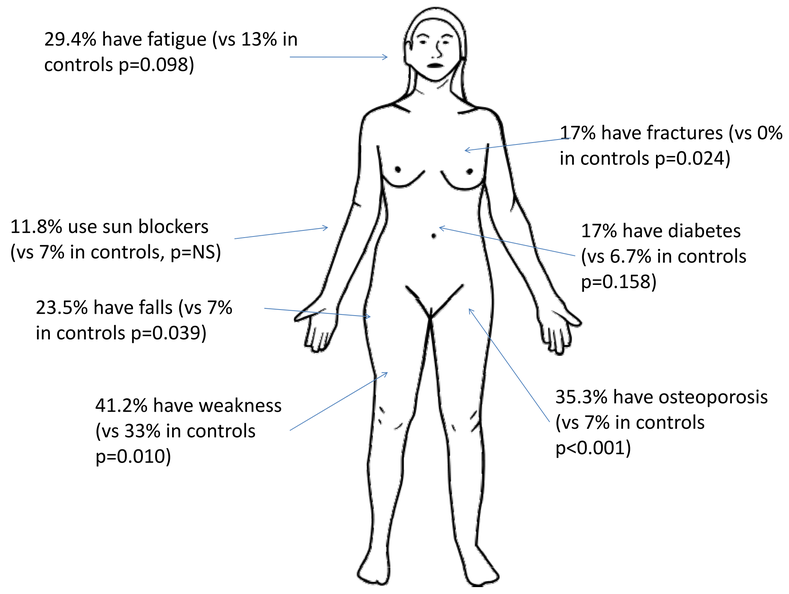

Table 1. Laboratory findings in patient with vitamin D deficiency and controls

	Cases (n=17)	Controls (n=15)	P
PTH (pg/ml)	146,86±103,76	47,82±13,77	0,001
Calcium (mg/dl)	8,98±1,33	9,38±0,74	0,341
Phosphorus (mg/dl)	4,09±2,27	2,99±0,88	0,165
Hours/week of sun exposure	0,60±1,19	1,46±2,14	0,268
Bone alkaline phosphatase (U/L)	37,96±27,99	31,40±12,64	0,656
Osteocalcin (ng/mll)	12,06±12,95	11,38±8,34	0,929
Deoxy pirilink D (nM DPD/nM)	7,43±3,95	6,40±2,83	0,678
Tartrate-resistant acid phosphatase (ng/ml)	3,03±0,85	3,22±1,04	0,804

Table 2. Risk factors and comorbities in patients with vitamin D deficiency and controls

	Cases (n=17)	Controls (n=15)	P
Falls	23.5%	6,7%	0,039
Nephrotic syndrome	5.9%	0%	0,452
Chronic liver disease	5.9%	0%	0,452
Chronic renal failure	11.8%	0%	0,257
% patients in nursing homes	70.6%	80.7%	0,254
Frequent sun blocker use	11.8%	6.7%	0,149
Use of liver enzimatic inducers	29.3%	0%	0,009
Fractures	17,6%	0%	0,024
Diabetes	17,6%	6,7%	0,158

Discussion

Despite abundant sunlight, prevalence of vitamin D deficiency is very high among Indian and South Asian populations, where it may be as high as 97% (Zargar 2007). Lack of sun exposure is a risk factor for vitamin D deficiency. In our series there was a trend toward lower amounts of sun exposure in these patients, although not statistically significant. Female gender is also reported as a risk factor, 80% of our cases were women. Other risk factors are renal and liver disease, institutionalization of patients, aging and use of anticonvulsant medications (Lee 2008). In our patients, the only risk factor that was statistically significant was the use of liver enzymatic inducers. We also found a high prevalence of musculoskeletal symptoms such as fatigue, weakness. There is also an increased rate of osteoporosis and fractures. A quarter of patients had history of falls and this will increase their fracture risk. When compared to the control group, there is a higher incidence of fatigue, weakness, fractures, diabetes, osteoporosis and falls. There was no difference in sun blocker use.
This study has several limitations. First of all, the sample is very small and this may explain why the differences did not reach statistical significance in several risk factors. All in all, this is the first report of vitamin D deficiency in Costa Rica. Second, this is just a descriptive study and we do not know if treatment with vitamin D may reverse some of the symptoms.

Conclusions

Vitamin D deficiency in Costa Ricans is more frequent in females. Patients have a more frequent history of fatigue, osteoporosis, falls, fractures, diabetes and use of liver enzymatic inducers. More research is needed to know the true prevalence of this condition in our country.

References

1. Ginde AA, Liu MC, Camargo CA. Demographic Differences and Trends of Vitamin D Insufficiency in the US population, 1988-2004. Arch Intern Med. 2009;169:626-632.
2. Holick MF, Chen TC. Vitamin D Deficiency: a worldwide problem with health consequences. Am J Clin Nutr. 2008;87(Supl):1080S-6S.
3. Lee JH, O'Keefe JH, Bell D, Hensrud DD, Holick MF. Vitamin D Deficiency. J Am Coll Cardiol. 2008;52:1949-56.
4. Michos ED, Melamed ML, Post W, Astor BC. 25-OH Vitamin D Deficiency and the Risk of All Cause Mortality in the General Population:Results from the Third Nationa Health and Nutrition Examination Survey Linked Mortality Data. Circulation. 2007;116:II_826.
5. Zargar AH, Ahmad S, Masoodi SR, Wani AI, Bashir MI, Laway BA, Shaz ZA. Vitamin D Status in Apparently Healthy Adults in Kashmir Valley of Indian Subcontinent. Postgrad Med J. 2007;83:713-716