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Seasonal Variation of Vitamin D in Ischemic Stroke

Authors
Richa Giri[1], Rohit Rai[2], Rajendra Kumar Verma[3], Shivendra Verma[4]
[1]Department of Internal Medicine, GSVM Medical College, Kanpur, India-208002
Email: *richa227@rediffmail.com*
[2]Department of Internal Medicine, GSVM Medical College, Kanpur, India-208002
Email: *tummu888@gmail.com*
[3]Department of Internal Medicine, GSVM Medical College, Kanpur, India-208002
Email: *rkv45anand@gmail.com*
[4]Department of Internal Medicine, GSVM Medical College, Kanpur, India-208002
E mail: *dr.shivendra@gmail.com*

Abstract
This study aimed to investigate the seasonal variation of serum vitamin D level in ischemic stroke patients. 217 patients with ischemic stroke were selected for analysis between ages 45 and 80 yrs admitted at our hospital from Jan 2014 to Dec 2015. Measurements of serum vitamin D concentration was made by electrochemiluminescence immunoassay. Confounding variables like diabetes, hypertension, smoking, alcohol, tobacco, dyslipidemia, BMI, CRP, S. uric acid, duration of sunlight exposure, prior history of drug intake or fracture and S. calcium were considered. 200 age and sex matched controls were taken. The mean serum level of vitamin D was 19.14 +/- 9.45 SD ng/mL. Highest vitamin D levels were seen in the month of July and low levels were seen during August and September. Vitamin D levels varied according to duration of sunlight exposure and season in ischemic stroke patients.

Keywords- *Vitamin D, cerebral infarction, seasonal variation*

Introduction

Low vitamin D levels were observed in majority of patients of ischemic stroke[1]. With change of season the duration for which the UV-B rays are incident on earth changes[2] also with increasing latitude there is more slanting of incident sunlight[3].

Cholecalciferol is synthesized in the skin when the UV B rays fall on it[4,5]. Increase in melanin was associated with low vitamin D synthesis[5]. Low vitamin D levels have been linked to several cancers[6], diabetes[7], hypertension[8] and cardiovascular diseases[9]. Vitamin D has been shown to have paracrine and autocrine effects on various tissues of the body[10]. It has pleiotropic effects on the cell and modulates cell differentiation and proliferation[11].

Methods

217 cases and 200 age and sex matched controls were selected from the outpatient department and medicine wards from January 2014 to December 2015. The cases satisfying the definition of ischemic

stroke were chosen and stroke was defined as rapidly developed signs of focal (or global) disturbance of cerebral function lasting >24 hours (unless interrupted by surgery or death), with no apparent nonvascular cause.

Patients with clinical diagnosis of stroke aged > 30 years irrespective of sex were included in the study if their CT scan of head or MRI Brain showed features of ischemic stroke while known cases of congenital heart disease, valvular heart disease, cardimyopathies and connective tissue disorders were excluded

Questionnaires were used for recording history and examination including total number of hours spent in sun. Serum vitamin D (25-hydroxy vitamin D) levels were measured by chemiluminescence method by Architect i1000SR Machine (Abbott laboratories, Abbott park, IL 60064 USA) from morning fasting sample. Serum uric acid, serum calcium, phosphorus, CRP, complete blood count, serum creatinine, BUN, Liver function tests, serum electrolytes, blood sugar (fasting and post prandial) and lipid profile of patients were measured by fully automated analysers. CT scan of Head (plain) and MRI Brain (wherever feasible and indicated) were done.

Results

Table 1: Characteristics of ischemic stroke patients

Males	140(65%)
Females	77(35%)
Average Weight(kg)	62.25
Average Height (cm)	160.67
Average BMI (kg/m^2)	24.12

12.9% cases had adequate vitamin D levels whereas 70.04% cases had vitamin D deficiency.

22% controls had adequate vitamin D levels whereas 43% controls had vitamin D deficiency

Highest vitamin D levels were seen in the month of July as during this period most of the days were sunny and low levels were seen during August and September as most of the days were cloudy. (fig 1)

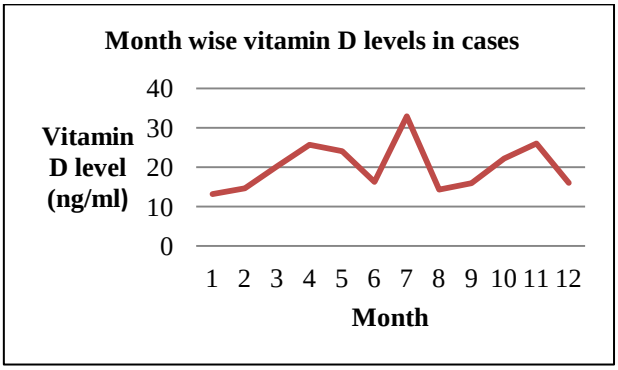

Figure 1: Month wise average vitamin D levels in cases

The variation of vitamin D levels with change in months was not statistically significant. (KW=12.73, p = 0.31)

Vitamin D deficiency was higher in cases(87%) as compared to controls(78%) and this association was found to be statistically significant(Chi square = 5.409, df=1, P = 0.02 and Odds Ratio=0.5253(95% CI:0.3125 to 0.8828)) (table 2)

Table 2: Comparison of deficiency of vitamin D in cases and controls

Parameter	Vitamin D (ng/ml) in cases	Vitamin D (ng/ml) in controls
Mean	19.142	23.974
N	217	200
Standard deviation	9.453	13.125

Mean vitamin D level in cases was 19.142+/- 9.453 SD ng/ml whereas in controls it was 23.974 +/- 13.125 SD ng/ml. This association was found to be statistically significant (t = 4.338 df=415 P=<0.0001) (table 3)

Table 3: Vitamin D levels in cases and controls

Vitamin D (ng/ml)	Cases	Controls	Total
<30	189(87%)	156(78%)	345
>30	28(12.9%)	44(22%)	72
Total	217	200	417

Discussion

Among the stroke patients seasonal variation was seen contrary to Chaudhary et al[12] who found no seasonal variation of vitamin D

Most of the cases and controls in our study were deficient in vitamin D similar to that stated by Lips P et al[13] where serum 25(OH)D was lower with higher latitudes and with darker skin types.

Low vitamin D levels were observed in 83% subjects in our study whereas 70.4% patients were deficient in the study done by Verdoia M et al[14]. They included patients undergoing elective coronary angiography whereas we included ischemic stroke and non stroke individuals.

Hsu JJ et al[15] found that there is a narrow range of vitamin D levels in which vascular function is optimized. Levels above or below this range seem to confer a significant increase in risk for cardiovascular disease.

With increased distance from the equator there were higher mortality rates as recognized by Fleck [16]. In the United Kingdom Grimes et al[17] also recognized that mortality from IHD was inversely proportional to the amount of hours of sunlight. He proposed vitamin D as a protective factor by regulating serum cholesterol levels or by inhibiting *Chlamydia pneumoniae*, once thought to be a cause of coronary heart disease. Douglas et al[18] recognized that incidence and mortality rates from coronary heart disease demonstrated a strong seasonal pattern with higher rates in the winter, when vitamin D levels are lowest . Rostand[19] reported that with increasing distance from the equator the blood pressure increased and suggested that cutaneously synthesized vitamin D could be playing a role in the regulation of blood pressure.

Conclusion

Majority of the population is deficient in vitamin D levels.

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References

1. Poole KE, Loveridge N, Barker PJ, Halsall DJ, Rose C, Reeve J, et al. Reduced vitamin D in acute stroke. Stroke. 2006;37:243–245
2. Frederick, J. E., Snell, H. E., & Haywood, E. K. (1989). Solar ultraviolet radiation at the earth's surface. *Photochemistry and Photobiology*, *50*(4), 443-450.
3. Diffey BL. Solar ultraviolet radiation effects on biologic systems. *Phys Med Biol*. 1991;36:299-328.
4. Rosen CJ, Adams JS, Bikle DD, et al. The Nonskeletal Effects of Vitamin D: An Endocrine Society Scientific Statement. *Endocrine Reviews*. 2012;33 (3):456-492. doi:10.1210/er.2012-1000.
5. Holick M F. Photosynthesis of vitamin D in the skin: effect of environmental and life-style variables. Fed Proc. 1987;46:1876–1882.
6. Khaw K-T, Luben R, Wareham N. Serum 25-hydroxyvitamin D, mortality, and incident cardiovascular disease, respiratory disease, cancers, and fractures: a 13-y prospective population study. *The American Journal of Clinical Nutrition*. 2014;100 (5):1361-1370.doi:10.3945/ajcn.114.086413.
7. Pittas AG, Dawson-Hughes B, Li T, Van Dam RM, Willett WC, Manson JE, Hu FB. Vitamin D and calcium intake in relation to type 2 diabetes in women. Diabetes Care. 2006;29:650–656.
8. Forman JP, Giovannucci E, Holmes MD, et al. Plasma 25-hydroxyvitamin D levels and risk of incident hypertension Hypertension. 2007;49:1063–1069
9. Judd S, Tangpricha V. Vitamin D Deficiency and Risk for Cardiovascular Disease. *Circulation*. 2008;117(4):503-511. doi:10.1161/CIRCULATIONAHA.107.706127.
10. Morris HA, Anderson PH. Autocrine and Paracrine Actions of Vitamin D. *The Clinical Biochemist Reviews*. 2010;31 (4):129-138.

11. Samuel, Sam, and Michael D. Sitrin. "Vitamin D's role in cell proliferation and differentiation."*Nutrition reviews* 66.suppl 2 (2008): S116-S124.
12. Chaudhuri JR, Mridula KR, Alladi S, et al. Serum 25-Hydroxyvitamin D Deficiency in Ischemic Stroke and Subtypes in Indian Patients. *Journal of Stroke*. 2014;16(1):44-50. doi:10.5853/jos.2014.16.1.44.\
13. Lips P. Worldwide status of vitamin D nutrition. J Steroid Biochem Mol Biol. 2010;121(1-2):297–300.doi: 10.1016/j.jsbmb.2010.02.021
14. Verdoia, Monica, et al. "Vitamin D deficiency is independently associated with the extent of coronary artery disease. "*European journal of clinical investigation* 44.7 (2014): 634-642.
15. Hsu, Jeffrey J., Yin Tintut, and Linda L. Demer. "Vitamin D and osteogenic differentiation in the artery wall." *Clinical Journal of the American Society of Nephrology* 3.5 (2008): 1542-1547.
16. Fleck A. Latitude and ischaemic heart disease. Lancet. 1989;1:613
17. Grimes, D. S., E. Hindle, and T. Dyer. "Sunlight, cholesterol and coronary heart disease." *Qjm* 89.8 (1996): 579-590.
18. Douglas AS, Dunnigan MG, Allan TM, et al. Seasonal variation in coronary heart disease in Scotland. J Epidemiol Community Health. 1995;49:575–82.
19. Rostand SG. Ultraviolet light may contribute to geographic and racial blood pressure differences. Hypertension. 1997;30 (2Pt 1):150–6.