THE PREVALENCE OF VITAMIN D DEFICIENCY IN TYPE 2 DIABETIC PATIENTS

[1*]Mansour Al-Zaharani

ABSTRACT

Background: *Recently, there is accumulating evidence to suggest that altered vitamin D and calcium homeostasis may play a role in the development and control of type 2 DM. Objective: The aim of the current study was to estimate the prevalence of vitamin D deficiency in type 2 DM.* ***Material and Methods***: *This is a cross-sectional study through screening of a random sample of patients with type 2 DM who recruited from Diabetes Clinics in Family Medicine and Primary Health Care at Health Care Specialty Clinic (HCSC)-King Abdul-Aziz Medical City in Saudi Arabia, Riyadh. For eligible patients, who matched the selection criteria, the following laboratory tests were performed; vitamin D level in form of (25 OHD), HbA1c, fasting blood glucose and lipid profile.* ***Results***: *In the current study, 248 type 2 diabetic patients had been screened for vitamin D deficiency. The great majority of diabetic patients had suboptimal level of vitamin D (98.4%). Almost three-quarters of female diabetic patients (73.6%) compared to less than half of male diabetic patients (46.9%) had vitamin D deficiency while approximately half of male patients (50.8% and one quarter of female patients (25.6%) had vitamin D insufficiency. This difference between them was statistically significant (chi-sq.=18.5, P<0.001).* ***Conclusions***: *The results of our study show that the great majority of type 2 diabetic patients having suboptimal vitamin D level. The majority of female diabetic patients (73.6%) while 46.9% of male diabetic patients were vitamin D deficient. Key words: vitamin D, vitamin D deficiency, diabetes mellitus*

ملخص : في الآونة الأخيرة تزايدت الأدلة التي تشير إلى أن توازن مستوى فيتامين د والكالسيوم في الجسم قد يلعب دوراً في الإصابة بداء السكري أو التحكم في مستوى السكر. **الهدف من الدراسة** :هدفت هذه الدراسة إلى معرفة معدل انتشار نقص فيتامين د بين مرضى النوع الثاني من داء السكري. **منهج الدراسة** :هذه دراسة مسحيه تم فيها أخذ عينة عشوائية من مرضى السكري وذلك في عيادات السكر التابعة لمدينة الملك عبدالعزيز الطبية للحرس الوطني في مراكز الرعاية الاولية بالرياض .وقد تم عمل الفحوصات التالية للمرضى الذين انطبقت عليهم شروط البحث: مستوى فيتامين د , المعدل التراكمي للسكر , معدل السكر أثناء الصيام ومستوى الكوليسترول في الدم . **النتائج** :تم عمل الفحوصات لـ 248 مريض حيث وجد أن غالبية المرضى لديهم نقص في مستوى فيتامين د وذلك بنسبة 98.4% من المرضى . كما وجدت الدراسة أن نسبة نقص فيتامين د عند النساء أكبر منها عند الرجال حيث بلغت نسبة النساء الذين يعانون من نقص معدل فيتامين د 73.6% مقارنة بالرجال 46.9% . **الخاتمة** : أظهرت هذه الدراسة أن غالبية مرضى النوع الثاني من السكر لديهم نقص في معدل فيتامين د . كما أظهرت أن نسبة النقص في فيتامين د عند النساء أعلى منه عند الرجال.

Received: 7 December, 2012; Accepted: 1 March, 2013
*Correspondence: mans859@hotmail.com
[1]Assistant Professor, Family Medicine, College of Medicine, Majmaah University, Al-Majmaah, Saudi Arabia

INTRODUCTION

The prevalence of Diabetes Mellitus in Saudi Arabia is one of the highest reported in the world, reaching up to 30% in a recent study[1].

Recently, researchers have shown an increased interest in the vitamin D deficiency. The major and most well-known function of vitamin D is to maintain calcium and phosphorus homeostasis and promote bone mineralization. More recently there is accumulating evidence to suggest that altered vitamin D and calcium homeostasis may also play a role in the development of type 2 DM[2, 3]. In most,[4-7] but not all,[8,9] case-control studies, patients with type 2 DM or glucose intolerance are found to have lower serum 25-OHD concentration compared with controls without diabetes. Hypovitaminosis D, owing to depletion or relative vitamin D resistance, has long been suspected to be a risk factor for glucose intolerance. A report from Martins and colleagues on data from over 15,000 adults in the Third National Health and Nutrition Examination Survey is perhaps the best recent evidence on vitamin D and the general population[21]. The 25(OH)-vitamin D levels were lower in diabetics, women, the elderly, and racial minorities, groups that are at increased risk of having chronic kidney disease (CKD)[21].

In type 2 diabetes, vitamin D may improve the cellular transfer of insulin message. Vitamin D may also contribute to survival of the islets and inhibit inflammatory processes. Some authors[10] report a relationship between low vitamin D levels in humans and reduced glucose stimulated insulin secretion. In some trials improvement of (glucose-stimulated) insulin release after vitamin D supplementation has been found but other studies have not confirmed this[11, 12] Most prospective studies are short term and give variable outcomes about the relationship between vitamin D levels and the development of diabetes[13, 14].

No local published researches have been found that surveyed the prevalence of vitamin D deficiency in type 2 DM patients.

The aim of the current study was to investigate the prevalence of vitamin D deficiency in diabetic people.

SUBJECTS AND METHODS

This is a case-control study included screening of 248 diabetic patients to estimate the prevalence of suboptimal vitamin D level.

A random sample of patients with type 2 DM were recruited in the period from July to the end of September 2009, from Diabetes Clinics in Family Medicine and Primary Health Care at Health Care Specialty Clinic (HCSC)-King Abdul-Aziz Medical City in Saudi Arabia-Riyadh. HCSC is a primary care and family medicine center, located at northeastern part of Riyadh. It services the soldiers and their dependents that belong to its catchments areas. We excluded diabetic patients with renal insufficiency, gestational diabetes and those taking vitamin D supplements.

For eligible patients, who matched the selection criteria, the following laboratory tests were performed; vitamin D level in form of (25 OHD), HbA1c and fasting blood glucose.

In order to identify diabetic patients with suboptimal vitamin D levels, the subjects were given appointment after two to three weeks to check their vitamin D level results. Blood samples were obtained from 248 patients who received blood work up requests. Total serum 25(OH) vit D levels were measured using the LIAISON ® 25 OH Vitamins D TOTAL assay, from

DiaSorin, USA. With following ranges for the classifications of vitamin D status:

Vitamin D status	25 OH Vitamin D
Deficiency	<25 nmol/L
Insufficiency	25-75 nmol/L
Sufficiency	75-250 nmol/L
Toxicity	>250 nmol/L

STATISTICAL ANALYSIS

Vitamin D level was treated as an independent variable and A1C, FBS, lipid profile, Body Mass Index and blood pressure were treated as dependent variables in statistical analysis. Data management and analysis was performed using Statistical Package for Social sciences (SPSS) software, version 16.

The study was conducted on human participants. All data was maintained in a secure and confidential manner. All participants' identification and associated data were separated. All data was analysed as total population in a manner that individual privacy was maintained. All records, results and progress, both electronic and written will be maintained with the researcher for a minimum period of two years in case of review. This statement was approved by the hospital research committee. A written informed consent taken from the participants in the intervention group clarifying the main purpose of the study, the importance of the respondent's views, the researchers name. Also, open letters explaining the steps of the study were distributed to all participants.

RESULTS

In the current study, 248 type 2 diabetic patients had been screened for vitamin D deficiency.

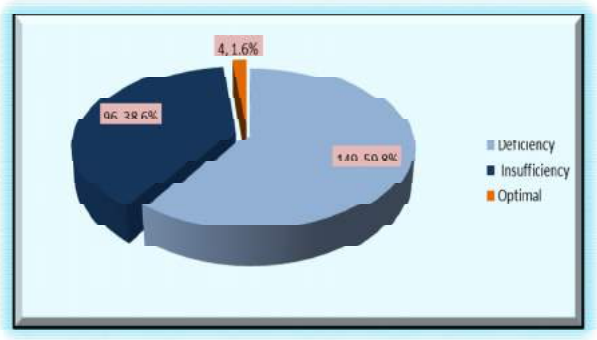


Figure 1: prevalence of vitamin D deficiency in type 2 diabetic patients of the study sample.

Figure (1) illustrates that more than half of them (149; 59.8%) were deficient in vitamin D (< 25 nmol/L), 96 patients (38.6%) had insufficient vitamin D level (25, 1-74.9 nmol/L) while only 4 patients (1.6%) had optimal vitamin D level (> 75 nmol/L). Thus, the great majority of diabetic patients had suboptimal level of vitamin D (98.4%).

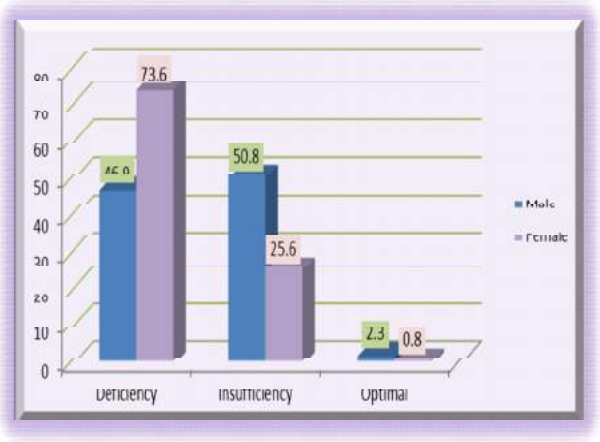


Figure 2: Prevalence of vitamin D deficiency among type 2 diabetic patients according to gender.

From figure 2, it is obvious that almost three-quarters of female diabetic patients (73.6%) compared to less than half of male diabetic patients (46.9%) had vitamin D deficiency while approximately half of male patients (50.8% and one quarter of female patients (25.6%) had vitamin D insufficiency. This difference between them

was statistically significant (chi-sq.=18.5, P<0.001).

DISCUSSION

Vitamin D deficiency or insufficiency is now recognized as a worldwide problem for both children and adults. [3] According to several studies, 40 to 100% of U.S. and European elderly men and women still living in the community (not in nursing homes) are deficient in vitamin D.[15] However, even in the sunniest areas, vitamin D deficiency is common when most of the skin is shielded from the sun. Studies in Saudi Arabia, the United Arab Emirates, Australia, Turkey, India, and Lebanon, 30 to 50% of children and adults had 25-hydroxyvitamin D levels under 50 nmol/L[16-18]. Moreover, The prevalence of low serum 25-hydroxyvitamin D (<50 nmol/l) is more common in diabetics compared with non-diabetics 83% vs. 70%; p = 0.07.[19] The results of our study show that 98.4% of our participants having suboptimal vitamin D level. This study produced results which corroborate the findings of a great deal of the previous work in this field. The majority of female patients 73.6% were vitamin D deficient (<25 nmol/L) while 46.9% of male patients. This result could be attributed to less sun exposure in female patients relative to male patients in our community.

It is not clear what levels of vitamin D are sufficient. It may be that levels of vitamin D within the normal range for an effect on bone formation and calcium metabolism are too low to reduce the emergence of diabetes mellitus and to improve glucose homeostasis, but a clear minimum level of 25(OH)D3 needed for slowing the development of diabetes mellitus has not been established. The prescription of extra vitamin D during the early phase of diabetes is still experimental[20].

Our study has considerable strength as the first local study, up to our knowledge, to estimate the prevalence of vitamin D deficiency among type 2 diabetic patients. Also, the measurements of vitamin D was performed in one laboratory, hence comparison of serum 25(OH) D levels was valid, we included a considerable large group of subjects and the response rate was high (91.5%).

CONCLUSION

The results of our study show that the great majority of our participants having suboptimal vitamin D level. The majority of female patients (73.6%) while 46.9% of male patients were vitamin D deficient.

REFERENCES

1. Alqurashi KA, Aljabri KS, Bokhari SA. Prevalence of diabetes mellitus in a Saudi community. Ann Saudi Med. 2011 Jan-Feb;31(1):19-23.
2. Bischoff-Ferrari HA, Giovannucci E, Willett WC, Dietrich T, Dawson-Hughes B. Estimation of optimal serum concentrations of 25-hydroxyvitamin D for multiple health outcomes. Am J Clin Nutr 2006; 84:18–28.
3. Holick MF. High prevalence of vitamin D inadequacy and implications for health. Mayo Clin Proc 2006; 81:353–373.
4. Cigolini M, Iagulli MP, Miconi V, Galiotto M, Lombardi S, Targher G. Serum 25-hydroxyvitamin D3 concentrations and prevalence of cardiovascular disease among type 2 diabetic patients. Diabetes Care 2006; 29:722–724.
5. Hypponen E, Power C. Vitamin D status and glucose homeostasis in the 1958 British birth cohort: the role of obesity. Diabetes Care 2006; 29:2244–2246.
6. Aksoy H, Akcay F, Kurtul N, Baykal O, Avci B. Serum 1,25 dihydroxy vitamin D (1,25(OH)2D3), 25 hydroxy vitamin D (25(OH)D) and parathormone levels in diabetic retinopathy. Clin Biochem 2000; 33:47–51.

7. Isaia G, Giorgino R, Adami S. High prevalence of hypovitaminosis D in female type 2 diabetic population. Diabetes Care 2001; 24:1496.
8. Ishida H, Seino Y, Matsukura S, Ikeda M, Yawata M, Yamashita G, et al. Diabetic osteopenia and circulating levels of vitamin D metabolites in type 2 (noninsulin-dependent) diabetes. Metabolism 1985; 34:797–801.
9. Lambert PW, Service FJ, Arnaud SB. Calcium homeostasis in diabetes mellitus. J Clin Endocrinol Metab 1979; 49:462–466.
10. Baynes KC, Boucher BJ, Feskens EJ, Kromhout D. Vitamin D, glucose tolerance and insulinaemia in elderly man. Diabetologia1997, 40:344-7.
11. Nyomba BL, Auwers J, Bormans V, Peeters TL, Pelemans W, Reynaert J, et al. Pancreatic secretion in man with subclinical vitamin D deficiency. Diabetologia 1986, 29:34-8.
12. Orwoll E, Riddle M, Prince M. Effects of vitamin D on insulin and glucagon secretion in non-insulin-dependent diabetes mellitus. Am J Clin Nutr 1994; 59:1083-7.
13. Teegarden D, Donkin SS. Vitamin D emerging new roles in insulin sensitivity. Nutr Res Rev 2009; 22:82-92.
14. Sue Penckofer, JoAnne Kouba, Diane E. Wallis, Mary Ann Emanuele. Vitamin D and Diabetes: Let the Sunshine In. The Diabetes Educator 2008; 34; 939.
15. Nesby-O'Dell S, Scanlon KS, Cogswell ME. Hypovitaminosis D prevalence and determinants among African American and white women of reproductive age: Third National Health and Nutrition Examination Survey, 1988-1994. Am J Clin Nutr 2002; 76: 187-192.
16. Sedrani SH. Low 25-hydroxyvitamin D and normal serum calcium concentrations in Saudi Arabia: Riyadh region. Ann Nutr Metab 1984; 28:181-5.
17. Marwaha RK, Tandon N, Reddy D, et al. Vitamin D and bone mineral density status of health schoolchildren in northern India. Am J Ckin Nut 2005; 82:477-82.
18. El-Hajj Fuleihan G, Nabulsi M, Choucair M, et al. Hypovitaminosis D in healthy schoolchildren. Pediatrics 2001; 107:E53.
19. Tahrani AA, Ball A, Shepherd L. The prevalence of vitamin D abnormalities in South Asians with type 2 diabetes mellitus in the UK. Int J Clin Pract, February 2010; 64, 3, 351–355.
20. Trivedi DP, Doll R, Khaw KT. Effect of four monthly oral vitamin D3 (cholecalciferol) supplementation on fractures and mortality in men and women living in the community: randomised double blind controlled trial. BMJ 2003 326 469–475.
21. Martins D, Wolf M, Pan D, et al. Prevalence of cardiovascular risk factors and the serum levels of 25-hydroxyvitamin D in the United States: data from the Third National Health and Nutrition Examination Survey. Arch Intern Med. 2007;167:1159-1165.