International Journal Of

Recent Scientific Research

ISSN: 0976-3031

Volume: 7(2) February -2016

STUDY OF VITAMIN D LEVEL IN RELATION TO PRESSURE ULCER IN ELDERLY

Mohammed Zein Abdulwadood and Safaa Hussein Ali

THE OFFICIAL PUBLICATION OF
INTERNATIONAL JOURNAL OF RECENT SCIENTIFIC RESEARCH (IJRSR)
http://www.recentscientific.com/ recentscientific@gmail.com

ISSN: 0976-3031

Available Online at http://www.recentscientific.com

International Journal of Recent Scientific Research
Vol. 7, Issue, 2, pp. 8970-8973, February, 2016

International Journal of Recent Scientific Research

RESEARCH ARTICLE

STUDY OF VITAMIN D LEVEL IN RELATION TO PRESSURE ULCER IN ELDERLY

Mohammed Zein Abdulwadood and Safaa Hussein Ali*

Geriatrics and Gerontology Department, Faculty of Medicine, Ain Shams University, Cairo, Egypt

ARTICLE INFO

Article History:

Received 05th October, 2015
Received in revised form 08th November, 2015
Accepted 10th January, 2016
Published online 28st February, 2016

Keywords:

Pressure ulcer, vitamin D and elderly

ABSTRACT

Background: Bed sores are major burden to hospital care and usually associated with worse prognosis and longer hospital stay. Nutritional factors can be a contributing factors that influencing the occurrence of pressure ulcers in susceptible patients. Studies showed that calcium and vitamin d signaling were considered a components of epidermal response to wounds through B-catenin transcriptional activity. Many factors are influencing vitamin D production in the skin including age as elderly people are less capable on enough vitamin D production due to thinner skin. Studies showes that active vitamin D upregulate cathelicidin expression in cultured keratinocytes [4-5], cathelicidin is an antimicrobial protein that mediates innate immunity in skin and promoting wound healing and tissue repair and its expression is upregulated during early stages of normal wound healing [6]

Aim: A case control study to study vitamin D level in patients with pressure ulcer in health care facilities

Methods: 80 immobilized elderly patients were enrolled and divided into four groups: acute 40 immobilized patients within 2 weeks post stroke who were subdivided into; group A (20 recent immobilized patients with bedsores) and group B (20 recent immobilized patients without bedsores). 40 chronic immobilized post stroke patients who were subdivide into; group C (20 old immobilized patients with bedsores) and group D (20 old immobilized patients without bedsores).25 hydroxy vitamin D, calcium, and serum phosphate were compared between the four groups.

Results: *Vitamin* D mean serum level was; (11.4 *ng/ml*, 12.2*ng/ml*, 23.4*ng/ml* and 27.4*ng/ml*) in groups A, B, C and D *correspectively*. There was a statistically significant difference for vitamin D level between early post immobilization groups (A and B) and late post immobilization groups (C and D) (P <0.001).Vitamin D was associated with increasing the likelihood of occurrence of early sores (group A) rather than late sores (group C) (odds:0.955 ,p =0.019) .Mean serum calcium level was (8.4 mg/dl ,9 mg/dl ,9 mg/dl and 9 mg/dl) in groups A ,B ,C ,and D correspectively . Calcium level was significantly lower in group A in comparison to other groups (P =0.009) .On Regression model calcium level was not associated with increase in the likelihood of occurrence of early sores (group A) rather than late sores (group C) (ODDS; 0.925, p = 0.0641)

Conclusions: Decreased vitamin D level was associated with increasing the likelihood of occurrence of pressure sores inrecently immobilized stroke patients rather than in old immobilized stroke patients (odds: 0.955, p =0.019).

INTRODUCTION

Pressure ulcers represent a common condition seen most often in high-risk populations. Such as older patients and those with physical impairment. The epidemiology of Pressure ulcers varies considerably by clinical setting, with incidence rates ranging from0.4% to 38% in acute care, 2.2% to 23.9% in long-term care, and 0% to 17% in home Care. (Lyder 2003)

Vitamin D is actually a fat-soluble prohormone steroid that has endocrine, paracrine and autocrine functions (Vanchinathan 2012). The endocrine effects of vitamin D are mainly involved in serum calcium homeostasis. Vitamin D primary role is to control the levels of calcium found in the bloodstream by increasing calcium and phosphate absorption from the intestine or taking calcium from bones. (Bikle 2011). Calcium and vitamin d signaling were considered a components of epidermal response to wounds through B-catenin

Corresponding author:* **Safaa Hussein Ali
Geriatrics and Gerontology Department, Faculty of Medicine, Ain Shams University, Cairo, Egypt

transcriptional activity (Oda *et al* 2015). Studies shows that active vitamin D upregulate cathelicidin expression in cultured keratinocytes (Sigmundsdottir *et al* 2007 , Weber *et al* 2005), cathelicidin is an antimicrobial protein that mediates innate immunity in skin and promoting wound healing and tissue repair and its expression is upregulated during early stages of normal wound healing (Gombart *et al* 2005).

Many factors are influencing vitamin D production in the skin including age as elderly people are less capable on enough vitamin D production due to thinner skin (Tsias2011, a-Holick 2007, Engelsen 2010).Vitamin D deficiency can occur also whenusual intake is lower than recommended levels over time, exposureto sunlight is limited, the kidneys cannot convert 25(oh) D by 25 hydroxy vitaminD to its active form, or absorption of vitamin D fromthe digestive tract is inadequate. Vitamin D-deficient diets are associated with milk allergy, lactose intolerance, and veganism (Institute of Medicine 2010)

METHODOLOGY

Ethics

This study had the approval of the ethics committee of the Ain Shams Faculty of medicine. All subjects consented (orally or written) to participation in the study

Study Design

Case control study

Patient Selection

Eighty elderly patients were enrolled. Acute stroke from the in-patient ward, of the Geriatric department, Ain-Shams University Hospital, and chronic patients with old stroke from long term care units and they were divided into four groups. All patient were immobilized

- ***Group A:*** Twenty stroke elderly patients who developed bedsore within two weeks of stroke event (recent immobilized with bedsores).
- ***Group B:*** Twenty stroke elderly patients who did not develop bedsore within two weeks of the stroke event (recent immobilized without bedsores).
- ***Group C:*** Twenty elderly patients who developed bedsore within six months of the stroke event (old immobilized with bedsores).
- ***Group D:*** Twenty elderly patients who did not develop bedsore within six months of the stroke event (old immobilized without bedsores).

Data Collection

At admission, each patient or his legal representative gave his or her informed consent and then Extensive demographic and clinical data were also collected at that time. Patients' baseline characteristics, including age and gender were collected. Laboratory data included 25 hydroxy vitamin D, calcium, and serum phosphate; all were compared between the four groups.

Assessment of bedsore risk

We used Braden scale to assess the risk of bed sores. The Braden Scale for Predicting Pressure Sore Risk® was developed by Barbara Braden and Nancy Bergstrom. The Braden Scale included in the Metathesaurus is extracted from LOINC® and may not be a complete representation of the original source.

Purpose

The Braden Scale for Predicting Pressure Sore Risk is a clinically validated tool that allows nurses and other health care providers to reliably score a patient/client's level of risk for developing pressure ulcers (Begestrom 1987). It measures functional capabilities of the patient that contribute to either higher intensity and duration of pressure or lower tissue tolerance for pressure. Lower levels of functioning indicate higher levels of risk for pressure ulcer development.

Statistical Methods

The collected data were coded, tabulated, and statistically analyzed using IBM SPSS statistics (Statistical Package for Social Sciences) software version 22.0, IBM Corp., Chicago, USA, 2013. Descriptive statistics were done for quantitative data as mean±SD (standard deviation) and minimum& maximum of the range for quantitative parametric data, while it was done for qualitative data as number and percentage. Inferential analyses were done for quantitative variables using independent t-test in cases of two independent groups with parametric data. In qualitative data, inferential analyses for independent variables were done using Chi square test for differences between proportions. One-Way ANOVA was used for comparing means between groups. The level of significance was taken at P value < 0.050 is significant, otherwise is non-significant.

RESULTS

The current study compared the 4 groups to each other regarding gender differences and male to female ratios were (1:1, 1:1, 0.9:1.1) in groups B, C and D correspectively. While male to female ratio was 1.3:0.7in group A. and this difference in group A showed statistical insignificance when compared to other groups (table 1). Regarding age; the mean age of the 4 studied groups A, B, C and D was (74.9 years , 64.9 years , 69.5 years , 77.9 years) correspectively with group B showed statistically significant lower age in comparison to other groups ($p < .001$) (table 1)

Subjects groups were matched to each other regarding prevalence of comorbities; with no statistical differences were found between groups regarding Diabetes mellitus DM ($p = .512$), hypertension HTN ($p = .712$), presence of impairment in cognitive functions ($p = 0.581$), congestive heart failure ($p = 0.446$), chronic renal failure ($p = 0849$) and chronic obstructive airway disease ($p = .698$).The prevalence of DM ranged from 45% in group A to 70% in group C while cognitive impairment ranged from 75% in group A to 90% in group C (table 1)

Table 1 comparison between study groups regarding age, gender and comorbities

Variables	Measures	Group A (N=20)	Group B (N=20)	Group C (N=20)	Group D (N=20)	P
Age in years	Mean±SD	74.9±10.5	64.9±12.3	69.5±7.3	77.9±10.2	^
	Range	70.0–79.8	59.1–70.6	66.1–72.9	73.1–82.6	<0.001
	HG	b, c	a	a, b	c	*
Gender	Male	13 (65.0%)	10 (50.0%)	10 (50.0%)	9 (45.0%)	&
	Female	7 (35.0%)	10 (50.0%)	10 (50.0%)	11 (55.0%)	0.614
	HG	a	a	a	a	
DM	Positive	9(45.0%)	13(65.0%)	14(70.0%)	11(55.0%)	&
	negative	11(55.0%)	7(65.0%)	6(30.0%)	9(45.0%)	0.512
	HG	a	a	a	a	
HTN	Positive	14(70.0%)	15(75.0%)	16(80.0%)	17(85.0%)	&
	negative	6(30.0%)	5(25.0%)	4(15.0%)	3(15.0%)	0.718
	HG	a	a	a	A	
Cognitive impairment	Positive	15(75.0%)	14(70.0%)	18(90.0%)	17(85.0%)	&
	negative	5(25.0%)	6(30.0%)	2(10.0%)	3(15.0%)	0.581
	HG	a	a	a	a	
CHF	Positive	4(15.0%)	5(25.0%)	1(5.0%)	3(15.0%)	&
	negative	16(80.0%)	15(75.0%)	19(95.0%)	17(85.0%)	0.446
	HG	a	a	a	A	
CRF	Positive	4(15.0%)	4(15.0%)	2(10.0%)	2(10.0%)	&
	negative	16(80.0%)	16(80.0%)	18(90.0%)	18(90.0%)	0.849
	HG	a	a	a	a	
COPD	Positive	3(15.0%)	4(15.0%)	1(5.0%)	2(10.0%)	&
	negative	17(85.0%)	16(80.0%)	19(95.0%)	18(90.0%)	0.698
	HG	a	a	a	a	

^ANOVA test with post hoc Tukey-B, & Chi square test with post hoc Chi square tests, *Significant,DM=diabetes MELLITES ,HTN=hypertension ,CHF=congestive heart failure ,CRF=chronic renal failure ,COPD =chronic obstructive pulmonary disease

Current study compared levels of vitamin D, serumcalcium, and serum phosphorus levels in patient groups with each other. Regarding vitamin D mean serum level was; (11.4 ng/ml, 12.2ng/ml, 23.4 ng/ml and 27.4 ng/ml) in groups A, B, C and D correspectively. There was a statistically significant difference for vitamin D level between early post immobilization groups (A and B) and late post immobilization groups (C and D) (P <0.001)(table 2).This difference was not found when comparing group A and B together or when comparing group C and D together . Vitamin D was associated with increasing the likelihood of occurrence of early sores (group A) rather than late sores (group C) (odds: 0.955, p =0.019) (table 3)

Table 2 comparison of vitamin D, serum calcium level and phosphorus level between groups

Variables	Measures	Group A (N=20)	Group B (N=20)	Group C (N=20)	Group D (N=20)	P
Vitamin D (Ng/ml)	Mean±SD	11.4±10.6	12.2±13.2	23.4±7.6	27.4±9.8	^
	Range	5.2–17.5	5.2–19.2	19.9–27.0	22.8–32.0	**<0.001***
	HG	a	a	b	b	
Ca Mg/dl	Mean±SD	8.4±0.9	9.0±0.5	9.0±0.7	9.0±0.5	^
	Range	8.0–8.8	8.7–9.2	8.7–9.3	8.8–9.2	**0.009**
	HG	a	b	b	b	
Ph Mg/dl	Mean±SD	3.1±1.3	3.4±0.8	3.4±0.7	3.5±0.5	^
	Range	2.5–3.8	2.9–3.8	3.1–3.7	3.2–3.7	**0.656**
	HG	a	a	a	a	

^ANOVA test with post hoc Tukey-B, *Significant

Mean serum calcium level was (8.4 mg/dl, 9 mg/dl, 9 mg/dl and 9 mg/dl) in groups A, B, C, and D correspectively. Calcium level was significantly lower in group A in comparison to other groups (P =0.009) (table 2).On Regression modelcalcium level was not associated with increase in the likelihood of occurrence of early sores (group A) rather than late sores (group C) (ODDS; 0.925, p = 0.0641) (table 3)

Table 3 Regression model for factors increasing the likelihood of occurrence of early sores (group A) rather than late sores (group C)

Factor	P	OR	(95% CI)
Vit. D	0.019*	0.955	(0.920-0.992)
CALCIUM	0.0641	0.921	(0.75-1.45)
PHOSPHUEUS	0.842	0.54	(0.18- 1.45)

OR: Odd ratio, CI: Confidence interval, *Significant

Regarding serum phosphate level , mean serum level was (3.1 mg/dl , 3.4 mg/dl , 3.4 mg/dl , 3.5 mg/dl) in groups A ,B ,C and D correspectively with no statistical difference between groups (P = 0.656)(table 2).

DISCUSSION

The aim of study is to assess a hypothesis that vitamin D level is related to occurrence of pressure ulcers in immobilized elderly patients. The design of the study aimed to compare levels of vitamin D in acute patients within 2 weeks of being immobilizedand this subjects were divided into group A (those patients positive for pressure ulcers) and group B (those patients negative for pressure ulcers) .these acute patients were not taking any vitamin D supplement nor calcium supplements and were a community living populations just before stroke occurrence and being immobilized. On the other hand long term immobilized patients residents in long term nursing charity sponsored units in Cairo were collected, all of them were bed bound and they were divided as group C (long term post stroke immobilized with pressure ulcer) and group D (long term post stroke immobilized without pressure ulcers).

Groups were matched to each other regarding comorbidities distribution , gender distribution but regarding age distribution, current study data analysis showed that the age of group B (early post immobilization without pressure ulcer) were younger than the other 3 groups (p < 0.001).

The current study found that mean serum vitamin D ranges between 11.4 ng/ml for group A and 27.4 ng /ml for group D. although there is no agreement on a set point level of vitamin D that we can consider patient has insufficient vitamin D if his serum vitamin D is lower than that level . The American geriatric society, endocrine society of clinical practice guidelines and international osteoporosis foundation reported that vitamin D level above 30 ng/ml is required to prevent falls and fractures (American Geriatrics Society 2014 ,b Holick 2011, Dawson-hughes 2010), and if we consider this level for insufficiency, all study subjects will be considered insufficient for vitamin D .but with absence of a regional set point value and being from middle east can explain this low levels (in a study of global vitamin D status, vitamin D levels below 10 ng /ml were common in middle east and South Asia regions) (Mithal 2009). In the same time we may not consider vitamin D set level for fall and fracture risk prevention as the set level sufficient for other functions of vitamin D(as its functions on skin and immune cells).

By comparing mean vitamin D level in the 4 groups we found that there is a great difference of vitamin D level between acute and chronic cases (p <0.001). Low vitamin D level in acute

immobilization post stroke was also observed in a study of the impact of acute post stroke (within 1 week) immobilization on vitamin D and calcium, parathyroid hormone and bone resorption parameters (Sato *et al* 2000), also by reviewing the chronic groups lifestyle at nursing homes it was found that ; diet provided for chronic subjects residing at nursing homes was either liquid or semisolid meals with milk being the liquid to prepare food in breakfast and yogurt is a routine at lunch time ,meanwhile routine sun exposure was provided for as part of recreational activity in a large number of patients.

In between acute subjects groups there was no difference in vitamin D level between those subjects with pressure ulcers (Group A) and subjects without pressure ulcers (group B) .the same occurred with chronic immobilized subjects groups (group C and D), no statistical difference was found in vitamin D level.

Comparison of other bone markers, study did not found any difference in serum phosphorus level between study groups. As for serum calcium level current study found that serum calcium level was lower in group A in comparison to other groups. This finding is the opposite of other studies finding of increased serum calcium with increase bone resorption markers one week following immobilization (Sato *et al* 2000). This association between low calcium level and early occurrence of pressure ulcer post immobilization was not found on multivariate regression model

On multivariate regression model, study found that Vitamin-D is a significant factor that increases the likelihood of occurrence of early sores (group A) rather than late sores (group C).

Competing interests

No conflict of interest has been declared by the authors.

Acknowledgments

We acknowledge the study participants for their gracious help.

Disclosure statement

This paper was supported by Ain Shams University, geriatric department. All authors declare that there is no financial support or relationship that may pose conflicts of interest.

References

1. Lyder CH. Pressure ulcer prevention and management. *JAMA*. 2003; 289:223–226.
2. Vanchinathan V, Lim HW. A dermatologist's perspective on vitamin D. Mayo Clin Proc 2012; 87:372–80.
3. Bikle DD. Vitamin D metabolism and function in the skin. Mol Cell Endocrinol 2011; 347:80–9.
4. Oda Y, Tu CL, Menendez A, Nguyen T, Bikle DD. Vitamin D and calcium regulation of epidermal wound healing. J Steroid Biochem Mol Biol. 2015 Aug 14. pii: S0960-0760(15)30048-0. doi: 10.1016/j.jsb mb.2015.08. 011. [Epub ahead of print]
5. Sigmundsdottir H, Pan J, Debes GF, Alt C, Habtezion A, Soler D, *et al*. DCs metabolize sunlight-induced vitamin D3 to 'program' T cell attraction to the epidermal chemokine CCL27. Nat Immunol 2007; 8:285–93.
6. Weber G, Heilborn JD, Chamorro Jimenez CI, Hammarsjo A, To¨ rma¨ H, Stahle M. Vitamin D induces the antimicrobial protein hCAP18 in human skin. J Invest Dermatol 2005; 124:1080–2.
7. Gombart AF, Borregaard N, Koeffler HP. Human cathelicidin antimicrobial peptide (CAMP) gene is a direct target of the vitamin D receptor and is stronglyup-regulated in myeloid cells by 1,25-dihydroxyvitamin D3. FASEB J 2005; 19:1067–77.
8. Tsiaras WG, Weinstock MA. Factors influencing vitamin D status. Acta Derma Venereol 2011; 91:115–24.
9. Holick MF. Vitamin D deficiency. N Engl J Med 2007; 357:266–81.
10. Engelsen O. The relationship between ultraviolet radiation exposure and vitamin D status. Nutrients 2010; 2:482–95.
11. Institute of Medicine, Food and Nutrition Board. Dietary reference intakes for calcium and vitamin D. Washington, DC: National Academy Press; 2010.
12. Bergstrom N, Braden BJ, Laguzza A, Holman V.The Braden Scale for Predicting
13. American Geriatrics Society Workgroup on Vitamin D Supplementation for Older Adults. Recommendations abstracted from the American Geriatrics Society Consensus Statement on vitamin D for Prevention of Falls and Their Consequences. J Am GeriatrSoc 2014; 62:147.
14. (b)Holick MF, Binkley NC, Bischoff-Ferrari HA, *et al*. Evaluation, treatment, and prevention of vitamin D deficiency: an Endocrine Society clinical practice guideline. J ClinEndocrinolMetab 2011; 96:1911.
15. Dawson-Hughes B, Mithal A, Bonjour JP, *et al*. IOF position statement: vitamin D recommendations for older adults. OsteoporosInt 2010; 21:1151.
16. Mithal A, Wahl DA, Bonjour JP, *et al*. Global vitamin D status and determinants of hypovitaminosis D. OsteoporosInt 2009; 20:1807.
17. Sato Y, Kuno H, Kaji M, Etoh K, Oizumi K. Influence of immobilization upon calcium metabolism in the week following hemiplegic stroke. J Neurol Sci. 2000 Apr 15; 175(2):135-9.

****

TSSN 0976-3031