Original Article

Vitamin D Deficiency Found in Young Females Suffering From Heart Diseases

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ABSTRACT

Objective: To analyse the association of vitamin D deficiency with age and gender in Islamabad.
Study Design: Prospective cohort study
Place and Duration of Study: This study was conducted at the Rawalpindi General Hospital and Institute of Biogenetic Engineering (IBGE) Islamabad from January2017 to December 2017.
Materials and Methods: A total of 110 subjects (age range 20-60 years) visiting Cardiac Clinic were enrolled in this study with informed consent. Blood 24Hydroxyvitamin D levels were assessed in the participants by using an electro chemiluminescence system.
Results: Our results showed that 40% of the patients were vitamin D deficient, 35.54% were vitamin D insufficient and 25.45% had normal vitamin D levels. We observed the highest level of vitamin D deficiency in patients of age group 31-40 years and insufficiency in age group 20-30years. A greater percentage of female patients (34.19%) were deficient in Vitamin D as compared to males (25.72%).
Conclusion: Low vitamin D levels are prevalent in young females in Islamabad suffering from cardiovascular diseases. Prevention of low vitamin D levels in individuals may help to avert development of heart diseases in Pakistan.

Key Words: Vitamin D deficiency, Age, Gender

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INTRODUCTION

Vitamin D, synthesized from a cholesterolprecursor, has a broad spectrum of action in the human body and is considered a steroid hormone. In multiple studies, its role is established in cardiac function and fertility. Its deficiency is found to be linked with coronary artery disease and heart failure.[1]

The American guideline has devised Vitamin D serum levels as (i) equal or below 20 ng/mL as deficiency, (ii) when between 20 and 30 ng/mL as insufficiency, while (iii) more than 30 ng/ml as normal.[2]

Genetic predisposition, reduced exposure to sunlight, non-standardized diet and malabsorption of vitamin D are the main risk factors implicated in vitamin D deficiency.

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Other factors being indoor lifestyle, old age, multiple births and lactation in females. Furthermore, Irritable bowel syndrome and steroid treatment also induce vitamin D deficiency. Ethnically, black skin people are comparatively more vitamin D deficient. Air pollution and cigarette smoking also predispose to vitamin D deficiency.[2,3]

In present day, vitamin D deficiency is affecting more than a billion human beings.[4,5] Yet masses of population with vitamin D deficiency (VDD) are rarely diagnosed and treated, especially in developing countries.[6-11], with unfortunately, Pakistan being one of them.[12-16] Normal vitamin D levels help an individual to avoid a number of common diseases including diabetes, infertility, rheumatoid arthritis, metabolic syndrome, respiratory diseases, coronary heart disease, multiple sclerosis, and can even reduce mortality rate[17].

But according to another school of thought, concrete evidence is lacking in association of Vitamin D deficiency with cardiovascular diseases and multiple sclerosis[4,18,19] Mainly the well-defined reasons have been established to be genetic factors, dietary deficiency, malabsorption syndrome and lack of exposure to clear sun. Advancing age, female gender with multiple children and sedentary lifestyle are found to be associated with vitamin D deficiency.[5,15,20] In Pakistan, female gender, dietary factors and genetics have the utmost important role. However, early diagnosis, fortified diet and calcium supplements can help prevent secondary complications and fractures.[11,21]

Even though numerous vitamin D deficiency studies have been reported in Pakistan yet, according to our knowledge, none has evaluated the levels of 25(OH)D deficiency among all age groups and genders of patients suffering from cardiovascular diseases in Islamabad. In Pakistan, vitamin D deficiency prevalence is alarmingly high despite having plenty of sun light all year round. Generally, females are moreaffected but the incidence is rising in younger population as well, who is fond of junk food and cold drinks made of substandard ingredients. Moreover, the availability of pure milk has become a major challenge and the new generation is not fond of taking milk. Government should closely monitor food and milk quality and take concrete steps for their standardization.

MATERIALS AND METHODS

The present prospective cohort study was carried out at IBGE and Rawalpindi General Hospital from January 2017 to December 2017. A total of 110 subjects (40 male and 70 females) suffering from heart diseases like hypertension, myocardial infarction or congestive cardiac failure (age range 20-60 years), admitted in the above-mentioned hospitals were enrolled. Subjects excluded from the study were those whose medical conditions were believed to have an effect on vitamin D metabolism including cancer, chronic endocrinal disorder like hyperthyroidism, diabetes, primary hyperparathyroidism, pituitary, adrenal malfunctioning and rheumaticfever or rheumatic heart diseases.We excluded, cases treated for Vitamin D deviancy, in previously 3 months. Blood 24 hydroxy vitamin D levels were assessed in the participants by electrochemiluminescence system (Roche E170, Germany)**.**The intra-assay coefficients of variation (CVs) for vitamin D were 5.7% at a level of 25.2 ng/mL, 5.7% at a level of 39.9 ng/mL, and 5.4% at a level of 65.6 ng/mL. The inter-assay CVs for 25(OH)D were 9.9% at a level of 25.2 ng/mL, 7.3% at a level of 39.9 ng/mL, and 6.9% at a level of 65.6 ng/mL, respectively. We set 4ng/ml as the lower detection limit for vitamin D. Blood 24Hydroxyvitmin D levels were assessed in the participants. The normal level of vitamin D was taken as 32-80ng/ml, a vitamin D level of <25ng/ml was considered as vitamin D deficiency, while levels ranging from 25-32ng/ml were labelled as vitamin D insufficiency.

Data was analysed using SPSS version 24. Mac. Pearson's coefficient for correlation was calculated for 25(OH)D levels with age and gender. Fisher's exact test and chi-square test were used for qualitative analysis of our results.

RESULTS

We excluded 40 (26.6%) cases out of 150 total patients carefully selected for this study, because their serum 25(OH)D was below the lower detection limit we defined for this study. This exclusion process left 110 participants (70 female and 40 male) finally for the study. The vitamin D values for these 110 cases, 70 females and 40 males (Table 1). Men have better overall vitamin D serum levels as compare to female participants. Young females in the age group of 31-40 years had significant deficiency of vitamin D(Table1). Pearson correlation analysis showed a significant correlation of vitamin D levels with age($r = -0.206^*$; $p < 0.05$) and gender ($r=-0.579^*$; $P<0.001$) (Tables 2-5).

Table No.1: Relationship of age and gender with vitamin D status

Age (years)	Gender	No.	Vit D (deficient)	Vit D (insufficient)	Vit D (normal)
20-30	Male	20	1 (2.27%)	-	7 (25.93 %)
	Female		1 (2.27%)	11 (28.20%)	-
31-40	Male	44	-	1 (2.56%)	6 (22.22 %)
	Female		35 (79.54 %)	2 (5.13%)	-
41-50	Male	23	-	7 (17.95%)	4 (14.81 %)
	Female		6 (13.63 %)	6 (15.38%)	-
51-60	Male	23	-	4 (10.26%)	10 (37.04 %)
	Female		1 (2.27%)	8 (20.51%)	-
Total		110	44 (40.00 %)	39 (35.54%)	27 (24.54 %)

Table No.2: Correlation of vitamin D Deficiency with age group

Variable	Age	Vit D (deficient) <25 ng/ml
Age		
Pearson Correlation	1	-.206*
Sig. (2-tailed)		.031
N	110	110
Vit D (deficient) <25 ng/ml		
Pearson Correlation	-.206*	1
Sig. (2-tailed)	.031	
N	110	110

*Correlation is significant at the 0.05 level (2-tailed).

Table No.3: Correlation of vitamin D deficiency with gender

Variable	Vit D (deficient) <25 ng/ml	Gender
Vit D (deficient) <25 ng/ml	1	.579**
Pearson		.000
Correlation	110	110
Sig. (2-tailed)		
N		
Gender		
Pearson	.579**	1
Correlation	.000	
Sig. (2-tailed)	110	110
N		

**Correlation is significant at the 0.01 level (2-tailed)

Table No.4.Co-rrelation of vitamin D deficiency with age and gender of patients

Vit D deficient	**Gender**	**Age**
Pearson correlation	0.579**	-0.26*
Sig(2-tailed)	0.00**	0.031*

Table No.5: Relationship of Vit D status (deficient, insufficient and normal) with gender

Vit D status	Gender		X^2	P value
	Male	Female		
Vit D deficient				
Yes	1 (2.30%)	43 (97.70%)	36.83**	**p<.01.
No	39 (59.10%)	27 (40.90%)		
Vit D insufficient				
Yes	12 (30.80%)	27 (69.20%)	12 (30.80%)	27 (69.20%)
No	28 (39.40%)	43 60.60%)	28 (39.40%)	43 60.60%)
Vit D normal				
Yes	27 (100%)	-	62.62**	**p<.01
No	13 (15.7%)	70 (84.3%)		

DISCUSSION

We believe this is the only study which was carried out in cardiac patients indicating that more females were deficient in vitamin D as compared to males in the younger age group. The men had a higher serum 25(OH)D levels than women and young females. In the age group of 31-40 years a significant number of females were deficientin vitamin D.

Comparatively greater prevalence of vitamin D deficiency is found in young females of Pakistan and similar results have been documented by studies previously in our part of world.[4,12,16,22-27] National Nutritional Survey reported vitamin D deficiency of moderate nature (40%) among children in 2011.[28] Other writers have found greater prevalence of VDD in postmenopausal females living in towns and flats as compared to those living in large bungalows and similar results have been reported from Saudi Arabia.[20,29]

Our results were comparable with one of the largest sample sized study conducted in Pakistan by Hassan et al[30] who estimated the burden of VDD in people from different geographical areas of Pakistan. Out of the total, 66.1% of subjects were found to be vitamin D-deficient. The minute apparent difference (66.1% vs 56.5%) may be explained by geo-graphic allocation, as we obtained data exclusively from Rawalpindi/ Islamabad region, while they reviewed data of Karachi. Our results were quite similar to another large sample sized study by Riaz et al[31] which published data of 4830 randomly selected citizens and reported that 53.5% had 25(OH)D deficiency and 31.2% had 25(OH)D insufficiency. We compared our results and found them to be in concurrence with a study conducted in the same geographic region by Khan et al[32], who reported that 56.2% subjects were 25(OH)D deficient. Earlier Khan et al[33], in 305 community-dwelling females, reported that 90.5% women were with 25(OH)D deficiency. Dar et al[34] reported the frequency of 25(OH)D deficiency (82.8%) and insufficiency (16.1) in 174 healthy premenopausal females. Iqbal & Khan[29] in their study on 215 participants at Lahore found 156 (73 %) to be vitamin D deficient. Mansoor et al[35] reported 25(OH)D deficiency and insufficiency in 123 healthy adults subjects and reported that 69.9% were vitamin D deficient and 21.1% had insufficient levels of vitamin D. Khan et al[32] reported a cross-sectional study results of 305 premenopausal women in Karachi, Pakistan and 90.1% were seen to be vitamin D deficient. These high figures are likely due to sample size effect as sample size in these studies is much smaller. Naqvi et al[36] estimated the prevalence of 25(OH)D deficiency in 360 obstetric cases at term, and found majority of (69.6%) females to be deficient.

In Pakistan, sun light is plenty in all four seasons of the year yet, the frequency of VDD is higher. Due to cultural and religious factors, women usually do not go out frequently and also wear a veil often completely covering their faces and bodies which can be a predisposing factor for higher prevalence of 25(OH)D deficiency. The general dietary ingredients are low in vitamin D content, indicating a need to fortify our basic diet. A higher phytate/calcium ratio may be linked with less calcium in basic diet ingredients which also reduces the calcium bioavailability in the gut. Which may raise blood parathyroid hormone levels and induces bone catabolism, which ultimately results in decreased serum 25(OH)D.

Now the all these studies suggest; either we in Pakistan are not getting enough sun exposure, we have low dietary intake or there is such genetic makeup in our population which hamper with vitamin D levels and its metabolism? More elaborated research is required to find the most agreed cause of VDD in our community settings, including investigation of expected genetic link. VDD is becoming a public health challenge in Pakistan and enormous efforts need to be made by public health authorities to educate the general population about the prevention and supplementation with this vitamin.

CONCLUSION

Our females, particularly young ones are more vulnerable to 25(OH)D deficiencyin Islamabad. Therefore, there is a dire need to devise and implement a particular program to cater to this severe deficiency by the Health Ministry of Government of Pakistan. We can prevent grave consequences including cardiovascular diseases in our population by simple recommendations and fortification of food stuff as prevention is more economical. Vitamin D has a pre-dominant role in various body metabolisms and functions, which is a well-established fact. Vitamin D availability depends on social and cultural factors also due to their effects on exposure to sunlight and adequate intake from diet or supplements.

Author's Contribution:

Concept & Design of Study:	Irfan Afzal Mughal
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Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Holick MF. Vitamin D deficiency. N Eng J Med. 2007;357(3):266-81.
2. Lee JH, O'Keefe JH, Bell D, Vitamin D deficiency. An important, common, and easily treatable cardiovascular risk factor? J Am Coll Cardiol 2008;52(24):1949-56.
3. Maeda SS, Borba VZ, Camargo MB, Silva DM, Borges JL, Bandeira F, et al. Recomendações da Sociedade Brasileira de Endocrinologia e Metabologia (SBEM) para o diagnóstico e tratamento da hipovitaminose. Arq Bras Endocrinol Metabol 2014; 58(5):411-33.
4. Sheikh A, Saeed Z, Jafri SA, Yazdani I, Hussain SA. Vitamin D levels in asymptomatic adults - a population survey in Karachi, Pakistan. PloS one 2012;7(3):e33452.
5. Humayun Q, Iqbal R, Azam I, Khan AH, Siddiqui AR, Baig-AnsariN. Development and validation of sunlight exposure measurement questionnaire (SEM-Q) for use in adult population residing in Pakistan. BMC Public Health2012;12:421.
6. Greene-Finestone LS, Berger C, de GrohM, Hanley DA, Hidiroglou N, Sarafin K, et al. 25- Hydroxy vitamin D in Canadian adults: biological, environmental, and behavioral correlates. Osteoporosis Int2011;22(5):1389-99.
7. Gill TK, Hill CL, Shanahan EM, Taylor AW, Appleton SL, Grant JF, et al. Vitamin D levels in an Australian population. BMC Public Health 2014;14(1):1001.
8. Ginde AA, Liu MC, Camargo CA, Jr. Demographic differences and trends of vitamin D insufficiency in the US population, 1988-2004. Arch Internal Med 2009;169(6):626-32.
9. van der Meer IM, Middelkoop BJ, Boeke AJ, Lips P. Prevalence of vitamin D deficiency among Turkish, Moroccan, Indian and sub-Sahara African populations in Europe and their countries of origin: an overview. Osteoporosis Int 2011;22(4):1009-21.
10. van Schoor NM, Lips P. Worldwide vitamin D status. Best Prac Res Clin Endocrinol Metab 2011; 25(4):671-80.
11. Hossein-nezhad A, Holick MF. Vitamin D for health: a global perspective. Mayo Clin Proc Mayo Clin 2013;88(7):720-55.
12. Mansoor S, Habib A, GhaniF, Fatmi Z, Badruddin S, Mansoor S, et al. Prevalence and significance of vitamin D deficiency and insufficiency among apparently healthy adults. Clin Biochem 2010; 43(18):1431-5.
13. Zuberi LM, Habib A, Haque N, Jabbar A. Vitamin D Deficiency in ambulatory patients. JPMA 2008; 58(9):482-4.
14. Palacios C, Gonzalez L. Is vitamin D deficiency a major global public health problem? J Steroid Biochem Molecular Biol 2014;144 Pt A:138-45.
15. Khan AH, Iqbal R, Naureen G, Dar FJ, Ahmed FN. Prevalence of vitamin D deficiency and its correlates: results of a community-based study conducted in Karachi, Pakistan. Arch Osteoporosis 2012;7(1-2): 275-82.
16. Iqbal R, Jafri L, Haroon A, Habib Khan A. Illuminating the dark side – vitamin D status in different localities of Karachi. JCPSP 2013; 23(8): 604-6.
17. Khaw LR, Wareham N. Serum 25-hydroxyvitamin D, mortality, and incident cardiovascular disease, respiratory disease, cancers, and fractures: a 13-y

prospective population study. Am J Clin Nutr 2014:1-10.
18. Peterlik M. Vitamin D insufficiency and chronic diseases: hype and reality. Food Function 2012; 3(8):784-94.
19. Guessous I, Bochud M. Effects of calcium and vitamin D supplementations on cardiovascular disease: review article. Rev Med 2012;8(348): 1458-63.
20. Thacher TD, Clarke BL. Vitamin D insufficiency. Mayo Clin Proc Mayo Clin 2011;86(1):50-60.
21. Laird E, Ward M, McSorley E, Strain JJ, Wallace J. Vitamin D and bone health: potential mechanisms. Nutrients 2010;2(7):693-724.
22. Madar AA, Stene LC, Meyer HE. Vitamin D status among immigrant mothers from Pakistan, Turkey and Somalia and their infants attending child health clinics in Norway. Br J Nutr2009;101(7):1052-8.
23. Brunvand L, Haug E. Vitamin D deficiency amongst Pakistani women in Oslo. Acta Obstetricia et Gynecologica Scandinavica 1993;72(4):264-8.
24. Masud F. Vitamin D levels for optimum bone health. Singapore Med J 2007;48(3):207-12.
25. Akhtar S, Ismail T, Zafar S, Wahid M, Gilani SA. Vitamin D status among female university students in Pakistan. Progress Nutr 2019;21(2):327-32.
26. Syed F, Latif MS, Ahmed I, Bibi S, Ullah S, Khalid N. Vitamin D deficiency in Pakistani population: critical overview from 2008 to 2018. Nutr Food Sci 2019.
27. Shafiq H, Majeed A, Mustafa M. Identification of single nucleotide polymorphisms in vitamin D deficient Pakistani population. Pak J Physiol 2019; 15(2):41-5.
28. Pakistan Government. National Nutritional Survey - Conducted by Aga Khan University, Pakistan. 2011URL:http://pakresponse.info/Link Click.aspx?fileticket=Ao4srwdFVI%3D&tabid=117&mid=7522011
29. Iqbal R, Khan A. Possible causes of vitamin D deficiency (VDD) in Pakistani population residing in Pakistan. JPMA 2010;60(1):1-2.
30. Hassan S, Muzammil SM, Jafri L, Khan AH. An audit of clinical laboratory data of 25[OH]D at Aga Khan University. J Pak Med Assoc 2015;65: 1247-50.
31. Riaz H, Finlayson AE, Bashir S, Hussain S. Prevalence of vitamin D deficiency in Pakistan and implications for the future. Expert Rev Clin Pharmaco l2016;9:329-38.
32. Khan H, Ansari MA, Waheed U, Farooq N. Prevalence of Vitamin D deficiency in general population of Islamabad, Pakistan. Ann Pak Inst Med Sci 2013;9:45-7.
33. Khan AH, Naureen G, Iqbal R, Dar FJ. Assessing the effect of dietary calcium intake and 25 OHD status on bone turnover in women in Pakistan. Arch Osteoporos 2013;8:151-3.
34. Dar FJ, Iqba lR, Ghani F, Siddiqui I, Khan AH. Bone health status of premenopausal healthy adult females in Pakistani females. Arch Osteoporos 2012;7:93-9.
35. Mansoor S, Habib A, Ghani F, Fatmi Z. Prevalence and significance of vitamin D deficiency and insufficiency among healthy adults. Clin Biochem 2010;43:1431-35.
36. Naqvi KZ, Ali ST, Thontia S. Prevalence of vitamin D deficiency in pregnant population attending a tertiary care hospital Karachi. Pak J Surg 2012;28:122-5.