Original article:

Status of Vitamin D by measuring 25 - Hydroxyvitamin D level in Dhaka City

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Abstract:

Background and aims: Vitamin D deficiency is associated with skeletal as well as extraskeletal diseases. Aim of this study was to find out the status of Vitamin D level in a densely populated area like Dhaka. ***Method:*** This descriptive cross sectional study was conducted in Ibn Sina Medical College Hospital in Kallyanpur, Dhanmondi Ibn Sina Hospital and Ibn Dina Diagnostic Laboratory in Dhanmondi. Total 500 subjects who went for vitamin D assay were included in this study. Serum Vitamin D (25 - Hydroxyvitamin D**)** levels were measured by chemiluminescence immunoassay method. The respondents were divided in 4 age groups: (0-20) years, (21-40) years, (41-60) years and (61-rest) years. Data were presented by frequency distribution tables & graphs. ***Result:*** Out of the 500 respondents, 10.6% were in 0-20 age group, 30.8% were in 21-40 age group, 41.2% were in 41-60 age group and 17.4% were in 61-rest age group respectively. Mean age of total study subjects was 43.7 years. Male and female ratio was 33.2:66.8. Of the total 218(43.8%) participants had deficient level, 187(37.2%) had insufficient level, 90(18%) had sufficient level and only 5(1%) had toxic level of vitamin D. ***Conclusion:*** High prevalence of vitamin D deficiency was observed in 41 to 60 years age group people and female are more suffered than male. That's why vitamin D status screening in this age group should be a routine test.

Keywords: extraskeletal; deficient; osteoporosis; insufficient

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Introduction:

Vitamin D is a cholesterol derivatives fat soluble vitamin. Its active form is known as calcitriol. It maintains the calcium level and prevents skeletal diseases like ricket in children and osteomalasia in adult. It has wide field of activity on all most all organs of our body like heart, lungs, kidneys, immune system, reproductive organ, nervous system etc. So deficiency of this vitamin inhibits the normal harmony of our body. Endogenous source of vitamin D is ultraviolet - B rays of sunlight. Beyond the sunlight its exogenous sources are Salmon, mackerel, sardine, tuna fishes and also present in cod liver oil, fortified milk, cereals, egg yolk, mushrooms etc. Risk factors of Vitamin D deficiency are people with little exposure to sunlight[1], aged people who have a higher risk of having a vitamin D deficiency due to a combination of several risk factors, like less exposure sunlight, little intake of vitamin D in the diet, and less skin thickness which leads to further decreased absorption of vitamin D from sunlight[2]. others factors are malnutrition[3], obesity[4], regions far from the equator[5], spending more in indoor than outdoor[6], Darker skin color[7,8],malabsorption[9,10], inflammatory bowel disease, exocrine pancreatic insufficiency from cystic fibrosis, and short bowel syndrome.[10] which can all produce problems of malabsorption usually have higher rates of vitamin D deficiency. Vitamin D deficiency is also more common after surgical procedures that reduce absorption from the intestine; including weight loss procedures.[11] Critical illness is also related with vitamin D deficiency[12]. Supplement of vitamin D are**:** proper exposure to sunlight, fortified food supplementation and calcitriol given orally which may reduce the mortality rate without significant adverse effects[13].

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Testing Vitamin D Status

Plasma 25(OH)D or calcidiol (a summation of D_3 and D_2 forms) is the most reliable marker of vitamin D status. Immunoassays such as radioimmunoassay (RIA), enzyme linked immunosorbant assay (ELISA), chemiluminescence immunoassay and protein binding assays are used in routine testing of 25(OH)D in clinical laboratories. LCTMS (liquid chromatography tandem mass spectrometry) is the widely accepted reference method for 25(OH) D measurement. However, LCTMS is tedious, expensive and time consuming and therefore seldom used commercially. In our country usually we measure vitamin D by chemiluminescence immunoassay or enzyme linked immunosorbant assay (ELISA). Since vitamin D under nutrition is largely silent and subclinical, the indication for testing remains controversial. At present 25(OH)D test is the "most ordered test" in the USA. A similar trend has just begun in the upper socioeconomic stratum in India too. Surely, vitamin D status needs to be improved in most individuals in India and not just the privileged or a select few. However, testing every individual's vitamin D levels, in a population with such a high prevalence of vitamin D deficiency is not economically and practically feasible. Furthermore, whether subclinical vitamin D deficiency in otherwise healthy individuals should be treated or not, and to what target level of serum 25(OH)D remains controversial. It will be more cost-effective to implement aggressive nationwide vitamin D supplementation and food fortification programs for the benefit of all ostensibly healthy individuals.[14]

Method and material:

This descriptive cross sectional study was conducted in Ibn Sina Medical College Hospital in Kallyanpur, Dhanmondi Ibn Sina Hospital and Ibn Dina Diagnostic Laboratory in Dhanmondi. Data were collected from patients who were attending in outpatient and inpatient department of different disciplines of these hospitals from January 2018 to January 2019. Total 500 participants were included in this study. These hospitals are very well known and situated in different areas of this city. Usually all classes of people are treated in these hospitals. So we assumed that this study may represent the entire city. Serum Vitamin D (25 – Hydroxyvitamin D) levels were measured by chemiluminace immunoassay method. The data were divided in 4 age groups: (0-20) years, (21-40) years, (41-60) years and (61-rest) years. The data were presented in simple frequency distribution tables and graphs.

Ethical clearance: This study got approval from the Research and Ethics Committee of Ibn Sina Medical College Hospital prior the submission for publication.

Result:

According to the cut-offs value of serum vitamin D level in our country, they are divided into four categories. These are shown below in table 1.

Table1: Diagnostic cut-offs value of serum 25(OH)D

Status of serum 25(OH)D	Reference levels of serum 25(OH) D in ng/ml
Deficiency	<20
Insufficiency	21-30
Sufficiency	>30
Toxicity	>100

According to table 1, safe level of serum vitamin D is >30 to 100 ng/ml.

Among the total study subjects 166 (33.2%) were male and 334(66.8 %) were female.(figure1).

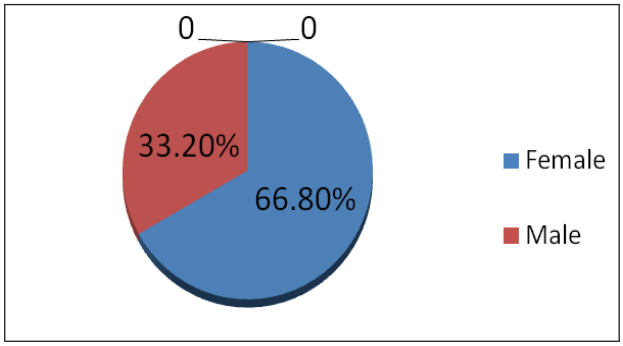

Figure 1: Distribution of male and female participants

In this study, male and female ratio was 33.2:66.8. Out of the 500 respondents, 53(10.6%) were in 0-20 age group; mean age 11.1 years, 154 (30.8%) were in 21-40 age group; mean age 30.7 years, 206 (41.2%) were in 41-60 age group; mean age 50.4 years and 87 (17.4%) were in 61-rest age group; mean age 70.7 years respectively. Mean age of total study subjects was 43.7 years.

Table 2: Distribution of participants in different age groups between male and female (n=500) according to vitamin D levels

Age (years)	Frequency	Male	Female	Vitamin D level(%)
1-20	53	17	36	10.6
21-40	154	69	85	30.8
41-60	206	46	160	41.2
61-rest	87	34	53	17.4

According to table 2, prevalence of vitamin D deficiency among the total participants was highest in 41 to 60 years age group. Female were more high risk group than male.

Of the total 218(43.8%) participants had deficient level, 187(37.2%) had insufficient level, 90(18%) had sufficient level and only 5(1%) had toxic level of vitamin D. (figure2).

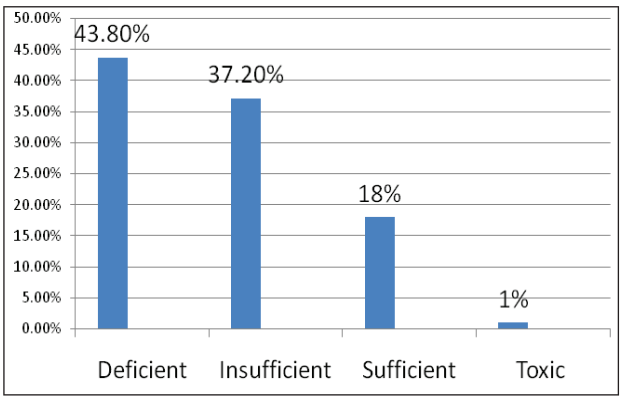

Figure2: Distribution of different levels of vitamin D according to cut off values of laboratory

According to figure 2, of the total participants 218(43.8%) study subjects were suffered from deficiency of Vitamin D in Dhaka city.

Discussion:

Vitamin D deficiency is highly prevalent in our country. Vitamin D assay is an important diagnostic tool to evaluate the status of vitamin D. This study showed that deficient, insufficient and sufficient level were 43.8%, 37.2%, 18% respectively, whereas in a study in India had shown 59 % were found to have 25(OH) vitamin D deficiency which included 69 % male and 31 % female. Similarly 25 (OH) vitamin D insufficiencies were observed in about 34 % individuals including 66.5 % male and 33.5 % female. Only 7 % of the total population had sufficient 25(OH) vitamin D levels which included 56 % male and 44 % female[15]. Amongst these, 67 % were male and 33 % female with a sex ratio of 2.07:1[15]. In present study revealed that prevalence of vitamin deficiency among male and female were 33.2% and 66.8% respectively with a sex ratio of 33.2:66.8. In compare with this Indian study, there was dissimilarity with the sex ratio[15]. But another Indian study found that the prevalence of vitamin D level <20 ng/ml in the Indian women was 64.06% and the prevalence of vitamin D level < 30 ng/ml in Indian women was 98.75%[16].

Many studies have demonstrated that the rate of vitamin D deficiency in veiled women was higher [17-19]. In our present study, subjects were not collected from the whole Dhaka city. Further study will require large size of sample for establishing more reliable results.

Conclusion:

Findings of this study revealed the alarming situation for vitamin D deficiency and insufficiency in Bangladesh. Moreover most of the people are reluctant to take treatment or go through any screening tests. Women are more deficient than male. So we recommend that awareness of endless source of vitamin D from sunlight should be raised. Progress our vitamin level by fortification of food with vitamin D and supplementation of vitamin D enriched food. So if we will not emphasis about vitamin D, in future it will be a great burden on our nation. It is also recommended to assess vitamin D status in vulnerable population as a routine practice.

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Editing and approval of final draft: Syeda Fahmida Afrin, Md Hasanur Rahman, AK Al-Mahmood

Reference;

1. Kennel KA, Drake MM, Hurley DL. Vitamin D Deficiency in Adults: When to Test and How to Treat, *Mayo Clinic Proceedings,* August 2010, pp752–758
2. Janssen HC, Samson MM, Verhaar HJ. Vitamin D deficiency, muscle function, and falls in elderly people. *Am J Clin Nutri.* April 2002*;* **75** (4): 611–5. doi*:*10.1093/ajcn/75.4.611. PMID 11916748.
3. Aziz M. Review Article Vitamin D Deficiency, Role in Chronic Diseases. *Inter J Sci Eng Res.* November 2016; **7**: 2229–5518.
4. Pereira-Santos M, Costa PR, Assis AM, Santos CA, Santos DB. Obesity and vitamin D deficiency: a systematic review and meta-analysis. *Obstet Rev.* April 2015;**16** (4): 341–9. *doi:10.1111/obr.12239*. *PMID 25688659*.
5. Cashman KD. Vitamin D in childhood and adolescence. *Post Med J.* April 2007 **83** (978): 230–5. *doi*:*10.1136/pgmj.2006.052787*. *PMC 2600028*. *PMID 17403948*.
6. Mithal A, Wahl DA, Bonjour JP, Burckhardt P, Dawson-Hughes B, Eisman JA, El-Hajj Fuleihan G, Josse RG, Lips P, Morales-Torres J. Global vitamin D status and determinants of hypovitaminosis D. *Osteoporosis Inter.* November 2009;**20** (11): 1807–20. *doi*:*10.1007/s00198-009-0954-6*. *hdl*:*1871/27487*. *PMID*
7. Yuen AW, Jablonski NG. Vitamin D: in the evolution of human skin colour. *Med Hypo.* January 2010;**74** (1): 39–44. *doi:10.1016/j.mehy.2009.08.007*. *PMID 19717244*.
8. *Heaney RP.* Functional indices of vitamin D status and ramifications of vitamin D deficiency. *Am J Clin Nutri.* December 2004;**80** (6 Suppl): 1706S–9S. *doi:10.1093/ajcn/80.6.1706S*. *PMID 15585791*.
9. Caruso R, Pallone F, Stasi E, Romeo S, Monteleone G. Appropriate nutrient supplementation in celiac disease. *Ann Med.* December 2013; **45** (8): 522–31. *doi:10.3109/07853890.2013.849383*. *PMID 24195595*.
10. Margulies SL, Kurian D, Elliott MS, Han Z. Vitamin D deficiency in patients with intestinal malabsorption syndromes--think in and outside the gut. *J Dig Dis.* November 2015;**16** (11): 617–33. *doi:10.1111/1751-2980.12283*. *PMID 26316334*.
11. Chakhtoura MT, Nakhoul N, Akl EA, Mantzoros CS, El Hajj Fuleihan GA. Guidelines on vitamin D replacement in bariatric surgery: Identification and systematic appraisal. *Metabolism.* April 2016;**65** (4): 586–97. *doi*:*10.1016/j.metabol.2015.12.013*. *PMC 4792722*. *PMID 26833101*.
12. *Bjelakovic G, Gluud LL, Nikolova D, Whitfield K, Wetterslev J, Simonetti RG, Bjelakovic M, Gluud C. Vitamin D supplementation for prevention of mortality in adults. Coch Database Sys Rev. January 2014;* **1** *(1): CD007470. doi*:*10.1002/14651858.CD007470.pub3*. *PMID 24414552*
13. *Putzu A, Belletti A, Cassina T, Clivio S, Monti G, Zangrillo A, Landoni G. Vitamin D and outcomes in adult critically ill patients. A systematic review and meta-analysis of randomized trials. J Criti Care. April 2017;* **38***: 109–114. doi*:*10.1016/j.jcrc.2016.10.029*. *PMID 27883968*.
14. Ritu G and Gupta A. Vitamin D Deficiency in India: Prevalence, Causalities and Interventions. *Nutrients;* 2014 Feb; **6**(2): 729–775. Published online 2014 Feb 21. doi: 10.3390/nu6020729, PMCID: PMC3942730, PMID: 24566435
15. Shukla K, Sharma S, Gupta A, Raizada A, and Vinayak K. Current Scenario of Prevalence of Vitamin D Deficiency in Ostensibly Healthy Indian Population: A Hospital Based Retrospective Study. *Ind J Clin Biochem* 2016;**31**(4):452-457. Received: 15 July 2015 / Accepted: 20 January 2016 / Published online: 1 Februar
16. Garg R et al. Prevalence of vitamin D deficiency in Indian women. *Int J Reprod Contracept Obstet Gynecol.* 2018 Jun;**7**(6):2222-2225. www.ijrcog.org. pISSN 2320-1770 | eISSN 2320-1789
17. el-Sonbaty MR, Abdul-Ghaffar NU. Vitamin D deficiency in veiled Kuwaiti women. *Eur J Clin Nutr.* 1996**;50:315–18. [PubMed]** [Google Scholar]
18. Meddeb N, Sahli H, Chahed M, Abdelmoula J, Feki M, Salah H, et al. Vitamin D deficiency in Tunisia. *Osteoporos Int.* 2005;**16:180–3. [PubMed]** [Google Scholar]
19. Guzel R, Kozanoglu E, Guler-Uysal F, Soyupak S, Sarpel T. Vitamin D status and bone mineral density of veiled and unveiled Turkish women. *J Womens Health Gend Based Med*. 2001;**10:**765–70. [PubMed] [Google Scholar]