Original Article

Vitamin D Status Among Patients Visiting an Urban Tertiary Care Hospital, Dhaka

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Abstract

Introduction*: Majority of the Bangladeshi population lives in an areas receiving ample sunshine throughout the year. Despite this fact multiple studies have shown wide prevalence of vitamin D deficiency in our country in all ages and both sexes. Adequate vitamin D status has an important clinical advantage for maintaining various activities as well as preventing diseases. In this lab based retrospective study, we determined the prevalence of vitamin D deficiency among adult patients visiting MH Samorita Hospital and Medical College outdoor.*

Objective: *The present study aimed to focus on assessing Vitamin D status of adult patients visited a tertiary care hospital of Dhaka city.*

Materials and Methods: *A total of 72 cases were chosen by random sampling with records of vitamin D status, age and sex from July to December, 2022.The results were statistically analyzed with Statistical Packages for Social Science (SPSS-24).*

Results**:** *Out of total subject (n=72) none of them showed toxic serum concentration of vitamin, 12.5 % had sufficient, 23.6% had insufficient and 63.9% had deficient levels of vitamin D. Gender wise comparison of vitamin D status showed male patients, 28.3% were deficient in vitamin D, 47.1% were insufficient, and a substantial 77.8% had sufficient levels. In contrast, a much higher proportion of female patients were deficient (71.7%) or insufficient (52.9%) in vitamin D, with only 22.2% having sufficient levels. According to age wise distribution, the highest percentage of vitamin D deficiency (58.7%) was observed in the youngest age group (18-30 years), while the proportion decreased in older age groups (30.4% for 31-50 years and 10.9% for 51-65 years).*

Conclusion*: Vitamin D is an important vitamin which impacts many systems of the body .This study indicates that 63.9 % of subjects are vitamin D deficient which is very much alarming. So it becomes paramount to further scrutinize the associated factors apart from age and gender. To this end, further studies are needed.*

Key words: *Vitamin D, Vitamin D deficiency, Insufficiency, Causes, Outcome.*

Introduction

Vitamin D is a lipid soluble vitamin which has both endogenous and exogenous sources. In addition to dietary sources like milk, fish, fish liver oils, egg yolk and dairy products, endogenous production on skin from 7- dehydrocholesterol with the help of ultraviolet ray of sunlight contributes in serum vitamin D level. It has to undergo activation which includes two steps of hydroxylation in the liver and kidney. It is found in two forms; ergocalciferol (Vitamin D2) found in plants and fungi and cholecalciferol (Vitamin D3) from the sun.

The physiologically active form of vitamin D [1, 25-dihydroxycholecalciferol] has tremendous role on calcium and phosphate homeostasis. Thus it helps in normal bone mineralization, bone growth and bone remodeling. It also plays a pivotal role on encoding proteins by specific genes that are involved in multiple cellular actions like cell proliferation, differentiation and cell death[1]. Furthermore, vitamin D activates T helper cells and contributes an as an important factor for anti-inflammatory properties of an individual[2]. It also found that vitamin D is associated with insulin production and secretion[3]. More than 30 sites in the body have vitamin D receptors which plays a vital role in the management of high blood pressure, high cholesterol, muscle weakness, rheumatoid arthritis, chronic obstructive pulmonary disease, premenstrual syndrome, various skin condition, various immune condition and psychological wellbeing. Recent research has demonstrated that vitamin D has an impact on several biological processes with several clinical implication including obesity, diabetes mellitus, metabolic syndrome, cancer and cardiovascular disease[4].

Measurement of serum concentration of 25(OH) vitamin D is the best indicator of body vitamin D status. It is the main transported metabolite form of vitamin D which reflects both endogenous and exogenous vitamin D and has a fairly long half-life of 15 days[1, 5]. In contrast, circulating 1, 25 (OH) vitamin D measurement is not considered as an effective indicator of circulating vitamin D status as it has a short half-life (15 hours) and the serum level is closely regulated by factors including parathyroid hormone, serum calcium and serum phosphate[6].

Recent epidemiological studies have found out an unpredictable high prevalence of vitamin D deficiency in the developed countries and the regions of Asia, the Middle East and India among apparently healthy adult mostly in women[7]. Bangladesh belongs to one of the sunniest regions in the world and while Bangladeshi population should have adequate sun exposer, vitamin D deficiency remains prevalent in this country.

It is calculated that 5-10 minutes sun exposer at least thrice a week is required for vitamin D sufficient production. Lack of exposure to sunlight is the leading cause of vitamin D deficiency as exemplified by a high prevalence of deficiency in housebound and elderly patients[8]. There are many other factors responsible for vitamin D deficiency in our country. Increased urbanization and migration from village to the cities have changed man's relationship to the sun. Outdoor activity with abundant unfiltered sunlight has been replaced by long indoor hours. Other factors may be malnourishment, changing food habits, high fiber diet and use of sunscreen, increased pollution and skin pigmentation[9].

Covering entire body surface for religious or cultural reasons when outdoors (Muslim religious dresses e.g.; hijab, niqb, burkha) which is practiced by many Muslim women may result into limited exposure to sunlight.[10] Among Muslim women, the degree of covering the skin also varies.

Hence, several studies have been conducted among Muslim women regarding this issue and many found significant level of insufficiency or deficiency of D vitamin among them[11].

Consequences of vitamin D deficiency are many, apart from rickets and osteomalacia. Deficiency of this vitamin has now been associated with diabetes, cardiovascular disease, chronic infections, irritable bowel syndrome etc. It has also been associated with cancer of breast, colon, prostate, ovary and lung, depression, immune disorder.

Although there had been several large scale studies done globally as well as in Asia to assess the prevalence of vitamin D deficiency, the studies done to assess the prevalence in urban city of Bangladesh are sparse. The aim of our study was to provide this information for preventing, treating and avoiding adverse health effects of vitamin D efficiency.

Materials and Methods

Adult males and females aged >18 years who attending outdoor of MH Samorita Hospital and Medical College , Tejgaon, Dhaka who were requested to undergo vitamin D assessment was recruited to the study. The data regarding the serum level of vitamin D were collected retrospectively from the clinical biochemistry section of laboratory and extended over 6 months. Total 72 samples were collected and measurement of vitamin D was done by chemiluminiscence analyzer. The reference range for vitamin D is as follows:

Deficiency - < 20 ng/ml

Insufficiency - 20 - 30 ng/ml

Sufficient - 30- 100 ng/ml

Toxicity - > 100 ng/ ml

All co-researcher involved in data collection & data interpretation were briefed and trained before commencement of the study. Primary outcomes of this study were vitamin D level in ng/ml and vitamin D status as deficiency, insufficiency, sufficient. Data was analyzed using the Statistical Packages for the Social Sciences (SPSS version).

Inclusion Criteria: Male and Female >18 years.

Exclusion Criteria: Pregnant, Known case of vitamin D deficiency, renal and liver failure patients.

Results

Table I: Age distribution of the study patients (n=72)

Age group (years)	Number of patients	Percentage (%)
18-30	32	44.4
31-50	29	40.3
51-65	11	15.3
Total	72	100.0
Mean±SD	35.8±13.3	
Range (min-max)	(18-65) years)	

Table I shows the age distribution of the study patients. The majority of patients (44.4%) were within the 18-30 years age group, followed by 31-50 years age group (40.3%). A smaller proportion of patients were in the 51-65 years age group (15.3%). The mean age of the study population was 35.8±13.3 years. The age range of the patients was from 18 to 65 years.

Table II: Sex distribution of the study patients (n=72)

Sex	Number of patients	Percentage (%)
Male	28	38.9
Female	44	61.1
Total	72	100.0
Male : Female ratio	1:1.6	

Table-2 shows the sex distribution of the study patients. Out of the 72 study patients, 61.1% were female, and 38.9% were male. The male-to-female ratio was 1:1.6.

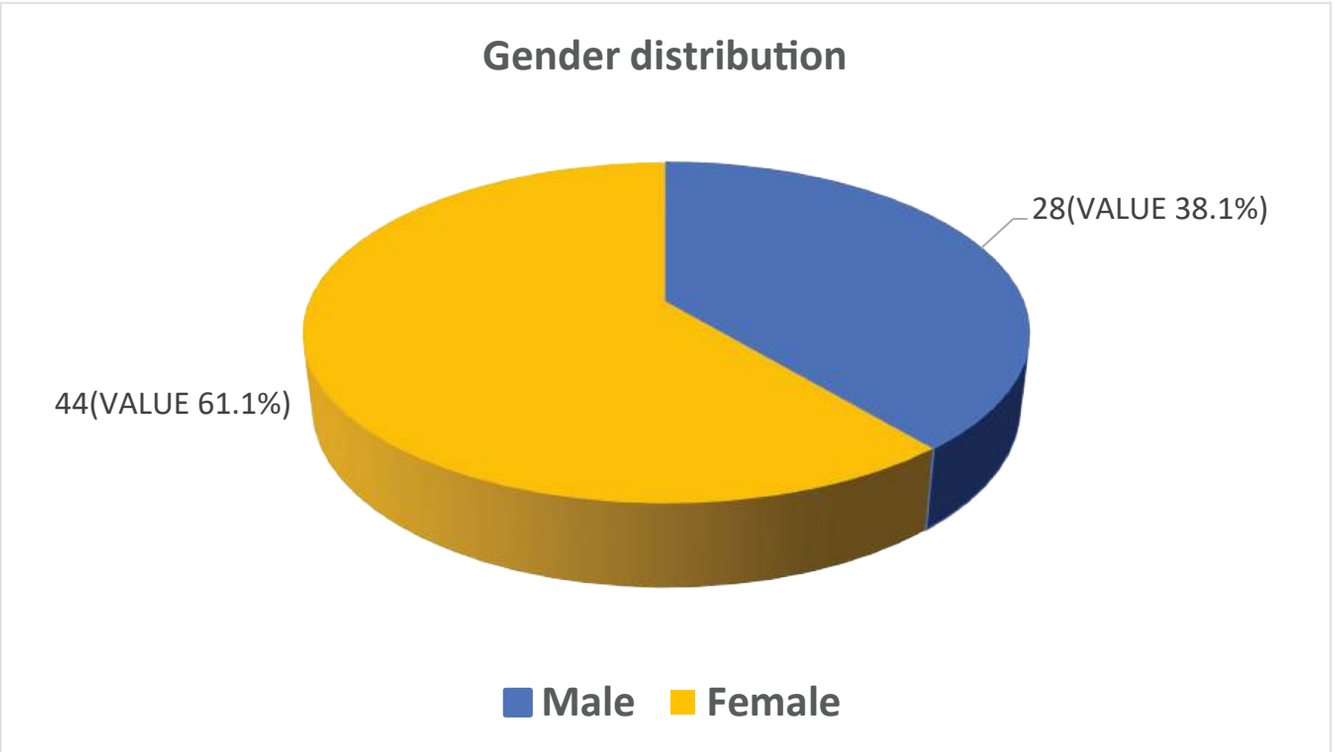

Figure 1: Pie diagram showing the sex distribution of the study subjects

Table III: Distribution of the study patients on the basis of concentration of vitamin D (n=72)

S. Vitamin D	Number of patients	Percentage (%)
Deficiency (<20 ng/ml)	46	63.9
Insufficiency (20-30 ng/ml)	17	23.6
Sufficiency (30-100 ng/ml)	9	12.5
Total	72	100.0
Mean±SD	19.6±9.69	
Range (min-max)	(5.72-62.2) ng/ml	

Table-III shows the distribution of patients based on their vitamin D levels. Among the 72 patients, the majority (63.9%) were classified as deficient in vitamin D (<20 ng/ml), while 23.6% were categorized as having insufficient levels (20-30 ng/ml). A smaller proportion (12.5%) had sufficient vitamin D levels (30-100 ng/ml). The mean vitamin D level in the study population was 19.6±9.69 ng/ml. The vitamin D levels ranged from 5.72 ng/ml to 62.2 ng/ml.

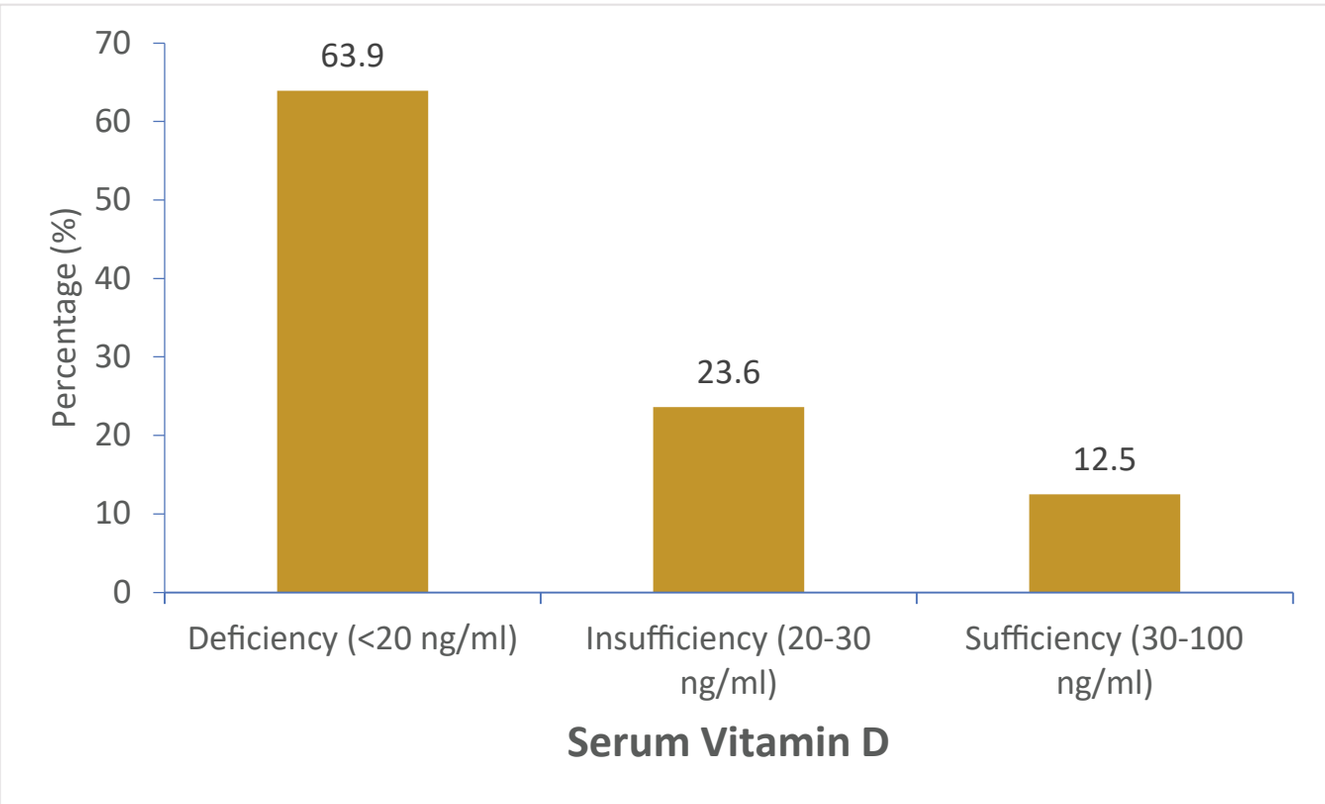

Figure 2: Bar diagram showing the serum Vitamin D status among the study participants

Table IV: Association of serum vitamin D with age group (n=72)

Age group (years)	Deficiency (<20 ng/ml)	Insufficiency (20-30 ng/ml)	Sufficiency (30-100 ng/ml)	*p*-value
18-30	27(58.7%)	3(17.6%)	2(22.2%)	0.002
31-50	14(30.4%)	12(70.6%)	3(33.3%)	
51-65	5(10.9%)	2(11.8%)	4(44.4%)	
Total	46(100.0%)	17(100.0%)	9(100.0%)	

Table IV shows the association between vitamin D levels and age groups. The results indicate a statistically significant association ($p<0.05$) between these variables. The highest percentage of vitamin D deficiency (58.7%) was observed in the youngest age group (18-30 years), while the proportion decreased in older age groups (30.4% for 31-50 years and 10.9% for 51-65 years). Conversely, the oldest age group had the highest proportion of patients with sufficient vitamin D levels (44.4%). These findings suggests that vitamin D deficiency might be more prevalent among younger individuals, whereas older individuals are more likely to have sufficient levels, which may have implications for age-specific interventions and monitoring.

Table V: Association of serum vitamin D with sex group (n=72)

Sex	Deficiency (<20 ng/ml)	Insufficiency (20-30 ng/ml)	Sufficiency (30-100 ng/ml)	*p*-value
Male	13(28.3%)	8(47.1%)	7(77.8%)	0.015
Female	33(71.7%)	9(52.9%)	2(22.2%)	
Total	46(100.0%)	17(100.0%)	9(100.0%)	

p-value obtained by Chi-square test, $p<0.05$ considered as a level of significance

Table-V explores the relationship between vitamin D levels and sex groups. The results indicate a statistically significant association ($p<0.05$) between vitamin D and sex. Among male patients, 28.3% were deficient in vitamin D, 47.1% were insufficient, and a substantial 77.8% had sufficient levels. In contrast, a much higher proportion of female patients were deficient (71.7%) or insufficient (52.9%) in vitamin D, with only 22.2% having sufficient levels. These findings highlight a potential gender difference in vitamin D status, indicating a higher prevalence of deficiency and insufficiency in females compared to males.

Among the randomly selected patients from the OPD at our Institution, 28 were male and 44 were female with a mean age of 35.8±13.3 years. Among the total patients assessed, 63.9% of patients in total were found to have Vitamin D deficiency. Among the 28 male assessed, 13 were found to have Vitamin D deficiency, while among the females, 33 had Vitamin D deficiency. Our studies demonstrate a higher level of deficiency and insufficiency among female than male.

Our data demonstrated that vitamin D deficient and insufficient individuals were in different age group of 18- 65 years old. We therefore separated the subjects in 3 different age groups. There was a statistically significant association found between age and vitamin D status. Our findings suggest that vitamin D deficiency might be more prevalent among younger individuals, whereas older individuals are more likely to have sufficient levels. Our study also showed significant relation between vitamin D deficiency and sex.

Discussion

The results of this lab-based retrospective study done in a tertiary care hospital of Dhaka, showed the prevalence of Vitamin D deficiency as 63.9%, of insufficiency as 23.6 %, and sufficient Vitamin D in 12.5 %. The prevalence of deficiency was higher among younger ages (18-30 yrs) and females.

Harinarayan et al.[12] in their study reported that 69.3% subjects were having vitamin D deficiency. Agarwal et al.[13] in their study reported 58% subjects were having vitamin D deficiency. Beloyartseva et al[14]. in their study reported that 79% subjects were having vitamin D deficiency. Our study findings showed 63.9% deficiency which is supported by all these studies.

Only 22.2% females in our study had sufficient levels of vitamin D whereas 52.9% had insufficient levels & 71.7% had frank deficiency. This shows that females are more prone to develop vitamin D deficiency. Different studies reveal that the common predictors of having low vitamin D status in this Southeast Asia were younger age, being female, living in an urban area and being less physically active[15,16]. There are many other evidences that females in Asian countries have lower 25(OH)D levels than in males[17,18]. High prevalence of Vitamin D deficiency in Bangladeshi females could be multi factorial – engaged in house hold work, accustomed to watch television, applying sunscreen lotions and creams etc. Though males engaged in outside work, involving the chance of exposure to sunlight; a significant percentage of males were deficient (28.3%) and (47.1%) insufficient in present study.

The women in our country largely stay at home which is almost closed to sunlight. The Muslim women of the

region also wear modest clothes which apart from face and hands cover all other parts of their bodies.

Our all the participants were living in urban area. It also founds in different survey that lower 25(OH)D levels in the urban population were consistently found in most geographical region of Asia[19,20]. Limiting outdoor activity due to urbanization also causes lower vitamin D status. Air pollutants efficiently absorb UVB radiation and thus reduce the amount that reaches the earth's surface.

Shefin SM et al found that Vitamin D insufficient subjects were more aged than deficient subjects.[21] In our study we also found that the predominant age for deficient group was 18- 30 years weather insufficiency was predominant at age group 31 to 50 years. It's also demonstrated predominant relation between age and vitamin D deficiency in our study.

Our data, therefore demonstrate that late adults and elderly women predominantly suffered from vitamin D insufficiency rather than deficiency. Interestingly, elderly in Southeast Asia such as Thailand and Korea have a better vitamin D status when compare with younger people[22]. The possible explanation is these elderly have more free time and spend time doing outdoor activities. The rapid economic development over the past decade in many countries of Southeast Asia has resulted in young adults having indoor jobs, while elderly adults tend to have outdoor jobs.[23] The high prevalence of vitamin D deficiency in young adults raises about a bone health concern in this critical period when they are achieving peak bone mass. Studies finding appropriate strategies to improve vitamin D status in this group of population are urgently wanted.

Vitamin D deficiency in South Asia has acquired epidemic proportions. It is surprising that in South Asia, where as much as 80% of the apparently healthy population is deficient in vitamin D (<20ng/ml) and up to 40% of the population is severely deficient (<9ng/ml)[24]. no public awareness program or mandatory supplementation of common foodstuff with vitamin D is being implemented by the governments.

Conclusion:

Vitamin D can be synthesized endogenously and with the sun exposure about 90% of the required Vitamin D is synthesized in the skin. It is required for controlling the normal levels of calcium and phosphate in the blood which are needed for contraction of muscle, normal mineralization of bone, nerve conduction, and general cellular function in all cells of the body and is also found to be important for immune function, for inflammation, cell proliferation, and differentiation. The high prevalence of vitamin D deficiency is an extremely important public health issue. Chronic deficiency of vitamin D in adults' causes' osteomalacia, osteoporosis, muscle weakness and increased risk of falls. There is well known Epidemiological support for skeletal benefits of vitamin D. In this study high prevalence of vitamin D deficiency was detected and can be concluded that in Bangladesh even though longer hours of sunshine were there, still there is deficiency of Vitamin D. There is a need for public awareness regarding the need for dietary rectifications and lifestyle changes providing opportunities for greater exposure to sunlight..

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