Original Article

Assessing Vitamin D Levels and Demographic Profiles of Adult Outdoor Patients: A Descriptive Cross-sectional Study in a District Medical College Hospital of Bangladesh

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Abstract

Background: *Vitamin D deficiency is a highly prevalent nutritional deficiency in Bangladesh. While the majority of the research has been done in the large metropolitan area, few studies have been conducted at the district level. Furthermore, little information has been discovered about the demographics of people with vitamin D deficiency. Thus, this study aimed to identify the district-level demographics of those who suffer from vitamin D insufficiency.*

Methods: *A descriptive cross-sectional study was conducted among 197 participants attending medicine outdoors at Sheikh Hasina Medical College Hospital, Tangail, Bangladesh. Detailed interview on socio-demographic and lifestyle factors and anthropometric measurement was conducted. Serum vitamin D level was estimated by chemiluminescent immunoassay. Data were analyzed by SPSS 22.0.*

Results: *About 46.2% of respondents had insufficient and 36.5% had deficient vitamin D levels. Serum vitamin D level was 22.68 ng/ml ± 7.83. Females (84.92%) had hypovitaminosis D more than males (78.87%) which was statistically significant. BMI, occupation, and monthly income had no significant role in different vitamin D status groups. Among females, wearing Burka had a significant relationship with low vitamin D levels.*

Conclusion: *Females are more prone to suffer from low vitamin D levels especially those who had less sun exposure due to choice of clothing. Prophylactic supplements of vitamin D may be considered in this group.*

Key Words:
Vitamin D, Demographic study, Bangladesh.

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Introduction:

Vitamin D deficiency is an under-recognized epidemic throughout the world, and over one billion people globally have insufficient or deficient vitamin D levels.[1] Vitamin D is a pro-hormone and having sufficient plasma vitamin D levels is considered a marker of "good" health. The major source of vitamin D in the body is skin biosynthesis from exposure to sunshine. On average, at least 80% of the total vitamin D in the body is generated in the skin.[2] Diet is another source of vitamin D, but few foods contain large amounts of vitamin D, except for some fatty fish and a few animal-derived foods, like dairy, fat, and eggs.[3]

Apart from the well-established role of vitamin D in maintaining good skeletal health (including osteoporosis, fractures, calcium, phosphorous, and bone metabolism), vitamin D deficiency is also associated with increased risk of obesity, diabetes, cardiovascular disorders (CVDs), autoimmune-, infectious-, and neuro-degenerative diseases including Alzheimer's and Parkinson's disease.[4,5]

Vitamin D deficiency is highly prevalent in Bangladesh ranging from 21 to 75 % for infants, children, and adolescents, 38 to 100 percent for premenopausal women, 66 to 94.2 % for pregnant women, 6 to 91.3 % for adult men, and 82 to 95.8 % for postmenopausal women.[6] Important underlying factors related to this silent epidemic

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include dark skin color, homebound and sedentariness, insufficient sunlight exposure, atmospheric pollution, clothing style, obesity, body weight/body mass index (BMI), old age, chronic disease, use of sunscreen and no supplementation.[6]

Bangladesh is located near the equatorial region and the climate in South Asian countries is sunny throughout the year, thereby creating ample possibilities of exposure to sunlight. However, due to the dark skin pigmentation, people living in Indian subcontinents require double the amount of UVB exposure to produce the same amount of vitamin D as compared to white Europeans.[7] The present study was done to assess serum Vitamin D levels among outdoor patients in a district medical college hospital in Bangladesh and to analyze the association of demographic factors with vitamin D levels.

Materials and Methods:

This was a descriptive cross-sectional study which was conducted at Sheikh Hasina Medical College Hospital, Tangail between Jamuary 2021 to December 2021.

Research question: Is there any relation of vitamin D deficiency with demographic profile among Bangladeshi people?

Objectives:

General objectives: To assess vitamin D levels and demographic profiles of adult outdoor patients.

Specific objectives:

1. To measure vitamin D levels among adult population.
2. To observe the demographic profiles of adult outdoor patients.
3. To find out any relation of vitamin D deficiency with demographic profile among adult population.

Study population: The participants were recruited after considering inclusion and exclusion criteria. Inclusion criteria were patients who attended the OPD of the medicine department and aged 18-85 years. Exclusion criteria were patients who already diagnosed with a case of rickets or hypocalcemia or any other abnormality involving liver or renal function after reviewing previous documents and examinations as these might affect vitamin D, calcium, and phosphate metabolism.

Sample size: By using single proportion formula taking the prevalence of hypovitaminosis D as 86% in Bangladesh,[8] sample size was estimated as follows-

$N = \frac{z^2 pq}{d^2}$, where N= desired sample size, Z=reflects the Standard score; we used 95 % confidence interval (CI) so the value of Z is 1.96, P= proportion of prevalence (86% was taken from the previous studies), D= margin of error between the sample and population, 5% marginal error was admitted.

$$\text{So , } n = \frac{z^2 pq}{d^2} = n = \frac{1.96x\ .96x\ .86x\ (1-0.86)}{0.05x\ .05} = 185$$

However 197 participants were finally selected after inclusion and exclusion criteria for better precision.

Data collection: A pretested structured questionnaire was administered to each subject to obtain information on socio-demographic profiles such as name, age, gender, educational qualification, present occupation, monthly income of the family personnel, food habits, and lifestyle factors.

Measurement of Vitamin D: After obtaining informed written consent, three milliliters of venous blood were withdrawn from the median cubital vein of individuals. The serum separation was carried out within 2 hours after collection by centrifugation at 2100 rpm for 7 min. Serum 25(OH) D levels were estimated by chemiluminescent immunoassay (chemiluminescence). The values were documented in ng/ml. Serum 25(OH)D was categorized as deficient (<20 ng/ml), insufficient (21 - 29 ng/ml), and sufficient (30 - 100 ng/ml).

Statistical analysis: Data were categorized and analyzed using SPSS for Windows version 22.0. Descriptive statistics were performed for age, gender, socioeconomic factors, food habits, and lifestyle factors.

Ethical consideration:

This study was approved by the ethical review committee of Sheikh Hasina Medical College, Tangail, Bangladesh. Privacy and anonymity of the participants were maintained. Informed written consent were taken from every participants.

Results:

A total of 197 persons were selected for the study after inclusion and exclusion criteria. Respondents were divided into three groups on the basis of serum Vitamin D level:

Group-1: deficient as <20 ng/ml,

Group-2: insufficient as 21 - 29 ng/ml and

Group 3: sufficient as 30 - 100 ng/ml.

Findings of the study are being showed in tables and figures:

Normality of the dataset

The normal distribution of the continuous variables was checked first before comparing the means among three groups of patients. Then according to the result, parametric and non-parametric tests were selected for comparing the means of the three groups.

Table 1

Normality test of continuous variable

Tests of Normality	Kolmogorov-Smirnov		
	Statistic	df	Sig.
Age	.080	88	0.200
BMI	.080	88	0.200
Vitamin D level	.084	88	0.168

This table shows that age, BMI and vitamin D level was in normal distribution.

The figure 1: Shows the serum vitamin D status among respondents.

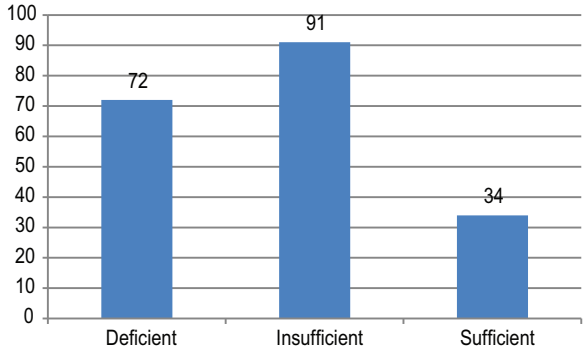

Figure 1: *Vitamin D status among respondents*

Figure 2: Illustrates that the serum vitamin D level was as low as 4.5 ng/ml to as high as 58.80 ng/ml. Mean serum vitamin D level was 22.68 ng/ml ± 7.83.

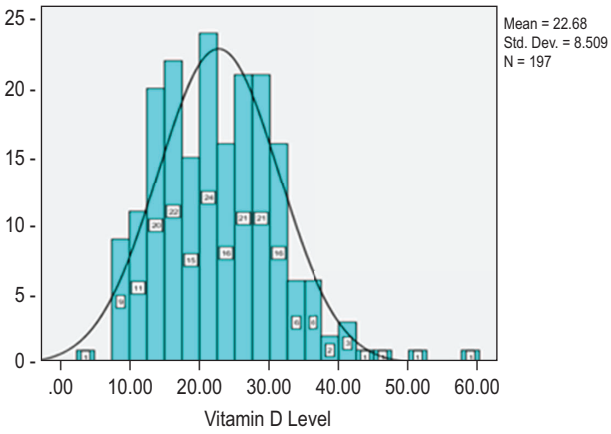

Figure 2: *Serum vitamin D level among the respondents*

The following table shows different characteristics of study population in relation to vitamin D status.

Table II

Demographic characteristics of study population in relation to vitamin D status.

Characteristics		Serum vitamin D status			P value
		Deficient (n=72)	Insufficient(n=91)	Normal(n=34)	
Gender	Male (n=71)	22	34	15	<0.001
	Female (n=126)	50	57	19	
Educational status	Illiterate(n=11)	4	5	2	0.184
	Primary(n=21)	7	11	3	
	SSC(n=52)	17	24	11	
	e"HSC(n=113)	44	51	18	
Occupation	Housewife(n-103)	47	46	10	0.213
	Service(n=28)	11	12	5	
	Student(n=13)	2	4	7	
	Businessman(n=24)	6	14	4	
	Agriculture(n=6)	2	1	3	
	Others(n=23)	4	14	5	
Resident	Urban(n=108)	39	50	19	0.371
	Rural(n=89)	33	41	15	
Monthly income (Taka)	<10,000(n=39)	18	5	6	0.073
	10,000-25,000(n=104)	38	46	20	
	>25,000(n=54)	16	30	8	

Table III

BMI and vitamin D level among the respondents

BMI	Serum Vitamin D level (ng/ml)(Mean ± SD)	P value
18-24	26.76 ± 5.47	0.147
25-29	22.43 ± 5.69	
>30	21.17 ± 4.23	

This table shows that BMI has no significant relation with vitamin D level.

The following table shows the significance of various personal and eating behaviors among female influencing low vitamin D level.

Table IV

ANOVA result of personal and eating behaviors among female having low vitamin D level

Description	P Value	Results with alpha level	Status of Significance
Milk consumption (200 mL)	.072	>0.05	insignificant
Burka	.011	<0.05	Significant
Egg consumption	.414	>0.05	insignificant
Fish consumption	.941	>0.05	insignificant
Time spent under the sun	.161	>0.05	insignificant
Calcium tablet	.246	>0.05	insignificant

Data shows that Burka has significant correlation for Vitamin D deficiency and insufficiency (Table II)

Discussion:

In this study, data were distributed normally as shown in Table 1. Most of the respondents had inadequate Vitamin D levels (36.5% had deficient and 46.2% had insufficient) which was consistent with the results found by Islam et al. They found that 86% had hypovitaminosis D (61.4% had a deficiency and 24.1% had insufficiency).[8] But the prevalence rate of deficiency was more than expected in this study. The cause may be homebound due to the lockdown during covid pandemic period. In this study mean serum vitamin D level was 22.68 ng/ml (± 11.34). The study done in Bangladesh by Islam AKMM et al. showed mean Vitamin D level was 21.66 (+/- 18.63) ng/ml which is nearly similar to this study.[8] We found more females had hypovitaminosis D than males which was statistically significant. Islam et al. also found females had more vitamin D deficit than males though that was not statistically significant.[8] The significant difference found in this study might be due to the more conservative society in this district than in Dhaka city. There were no significant differences in different vitamin D status groups in terms of education, occupation, and monthly income. Though urban residents had more hypovitaminosis D, this was not statistically significant. Kumar et al. found a significant difference in Vitamin D levels between urban and rural residents.[9] In a study, it was observed that in comparison with urban residents, large metro residents were 49% more likely, while rural residents were 20% more likely, to be vitamin D deficient.[10] Though in this study mean serum Vitamin D level was found low in overweight and obese persons, it was not statistically significant. It is similar to Bindayel et al. they found that BMI had no significant relationship with vitamin D level.[11] A significant correlation between wearing the Burka outside of the home and vitamin D levels was seen during a study of dietary and personal habits among females with low vitamin D levels. Several studies have found similar results that the risk of vitamin D deficiency is higher in veiled women. [12-15] Food habits like egg, fish, milk, and calcium tablet intake were found to have no significant relationship with vitamin D level.

Limitation: As the study was done during covid pandemic when the mobility of people was restricted, more respondents could not be included. Moreover, respondents were reluctant to provide sufficient time for detailed information. Funding was also an issue as this study was done by self-finance.

Conclusion:

The prevalence of vitamin D deficiency and insufficiency among adults in Bangladesh is high especially in women even at the district level. The study recommended that vitamin D supplementation and awareness about this pandemic in Bangladeshi adults should be taken into account by the government. Future studies also needed to address this issue furthermore.

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Conflicts of interest

There were no conflicts of interest.

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