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ORIGINAL ARTICLE

ASSESSMENT OF VITAMIN D STATUS IN ADULTS ATTENDING A TERTIARY CARE HOSPITAL IN DHAKA, BANGLADESH

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Abstract

Background: *Vitamin D (Vit D) is a fat-soluble steroid hormone crucial for skeletal health, immune function, and chronic disease prevention. Despite ample sunlight, a high prevalence of hypovitaminosis D has been reported in Bangladesh. This study aimed to determine the prevalence and correlates of Vit D deficiency(VDD) among adults attending a tertiary care facility in Dhaka.* ***Methods****: A cross-sectional study was conducted at the Bangladesh Institute of Health Sciences (BIHS) General Hospital, Dhaka, from 1st January 2021 to 31st December 2023. A total of 300 adult patients (N=300) meeting inclusion criteria were enrolled. Data on socio-demographics, lifestyle, and clinical presentation were collected via a structured questionnaire. Serum 25-hydroxyvitamin D [25(OH)D] was measured by Chemiluminescent Microparticle Immunoassay (CMIA).* ***Results:*** *The mean age of participants was 38.7±12.4 years, with 54.0% Female and 46.0% male. Hypovitaminosis D (25(OH)D<30 ng/mL) was present in 276 (92.0%) patients, comprising 179 (59.7%) deficient (<20 ng/mL) and 97 (32.3%) insufficient (20-29.9 ng/mL). Only 24 (8.0%) had sufficient levels. Deficiency was significantly higher in females (66.7%) compared to males (53.7%) (p=0.015), in those with indoor occupation (65.8%) (p=0.001), inadequate sun exposure (67.2%) (p=<0.001), and low fish intake (<2 times/week) (69.0%) (p=<0.001). The predominant presenting complaints were generalized fatigue (67.7%), bone/joint pain (59.3%), and muscle weakness (52.0%).* ***Conclusion****: An alarmingly high prevalence of Vit D deficiency was found among adult patients in this urban tertiary care setting. Female gender, indoor lifestyle, inadequate sun exposure, and poor dietary habits were significant risk factors. Public health strategies, including awareness campaigns, dietary fortification, and targeted supplementation, are urgently needed to address this silent epidemic.*

Keywords*: Vitamin D deficiency, Hypovitaminosis D, Adults, Tertiary Care, Dhaka, Bangladesh.*

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Introduction

Vitamin D (Vit D) is a fat-soluble seco-steroid predominantly synthesized in the skin upon exposure to ultraviolet B (UVB) radiation and minimally obtained from dietary sources like fatty fish, egg yolk, and fortified foods[1]. It undergoes hepatic conversion to 25-hydroxyvitamin D [25(OH)D], the major circulating metabolite used to assess status, and subsequent renal conversion to its active form, 1,25-dihydroxyvitamin D, which regulates calcium-

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phosphate homeostasis, bone metabolism, and myriad extraskeletal functions[2].

VDD is a global pandemic, affecting over one billion people worldwide[3]. Paradoxically, high prevalence rates are reported even in tropical, sun-rich countries like Bangladesh, creating a significant public health burden. A previous national study indicated that 86% of Bangladeshis have hypovitaminosis D, with 61.4% being deficient[4]. Factors contributing to this paradox include urbanization, indoor lifestyles, traditional clothing, air pollution, dark skin complexion, and low dietary intake of Vit D-rich foods[5].

VDD is associated with numerous negative health consequences such as osteomalacia, osteoporosis, muscle weakness, and falls[6-9]. Vit-D protects against the development of many cancers such as colon and breast cancer[10]. VDD has associations with both obesity and diabetes[10]. Fat content in a body is inversely correlated with Vit-D levels, and VDD may contribute to the development of both types I and II diabetes[11]. Through its role in calcium homeostasis indirectly and receptors on B-islet cells of the pancreas directly, vitamin D is involved in insulin secretion[12-14]. Improvement in glycemic control and reduction in risk of type 1 diabetes has been observed by supplementation of vitamin D and calcium in meta-analysis[13-15]. Vit-D boosts the immune responses and a few studies have reported an enhanced risk of acquiring tuberculosis and other respiratory infections because of VDD[16-20]. Hypovitaminosis D has a statistically significant inverse relationship with hypertension, obesity, diabetes, and hyper-triglyceridemia[21-23]. All these disorders are associated with increased cardiovascular risk and related mortality[21-23].Hospital-based studies provide critical insights into the clinical profile of deficiency among symptomatic populations. While data from tertiary centers in Bangladesh are emerging, detailed assessments from major urban facilities like Dhaka remain limited.

This study aimed to determine the prevalence of Vitamin D deficiency and insufficiency among adult patients attending the Bangladesh Institute of Health Sciences (BIHS) General Hospital, Dhaka. It further sought to evaluate associated socio-demographic, lifestyle, and clinical factors to inform targeted clinical and public health interventions.

Methods

A cross-sectional study was conducted in the outpatient and inpatient departments of the Bangladesh Institute of Health Sciences (BIHS) General Hospital, Dhaka, over two years from 1st January 2021 to 31st December 2023. A total of 300 adult patients (N=300) were enrolled using purposive sampling. Adult patients (age e”18 years) presenting with non-specific complaints suggestive of Vit D deficiency (e.g., generalized fatigue, body ache, muscle weakness, bone or joint pain) or those undergoing routine health check-ups were included. Patients on Vit D/calcium supplements within the last six months, those with chronic kidney/liver disease, malabsorption syndromes, active malignancy, pregnant/lactating women, and unwilling patients were excluded. Data were collected using a pre-tested, semi-structured questionnaire via face-to-face interviews. It captured socio-demographics (age, sex, occupation, education, residence, income), lifestyle factors (sun exposure habits, dietary patterns), and presenting clinical complaints. Under aseptic precautions, a 3-5 ml venous blood sample was drawn from each participant. Serum 25(OH)D concentration was determined in the hospital laboratory using a standardized Chemiluminescent Microparticle Immunoassay (CMIA) method on an Abbott Architect i2000SR analyzer[24].

Verbal and written informed consent was obtained from all participants. Ethical approval was granted by the Institutional Ethical Review Committee of BIHS General Hospital. Confidentiality of all data was strictly maintained. Vitamin D status was classified per Endocrine Society guidelines[25].Deficient (<20 ng/mL), Insufficient (20-29 ng/mL), Sufficient (e”30 ng/mL). Hypovitaminosis D was defined as 25(OH)D <30 ng/mL.

Completed questionnaires were reviewed, coded, and entered electronically. Data were analyzed using SPSS version 26.0. Descriptive statistics (frequency, percentage, mean ± SD) were used. Prevalence rates were calculated with 95% confidence intervals (CI). Associations between Vit D status and other variables were analyzed using the Chi-square (÷²) test. A p-value <0.05 was considered statistically significant.

Results

The demographic analysis of the study population (N=300) revealed a mean age of 38.7 ± 12.4 years, with the largest proportion falling within the 31-45 year age group (39.3%). The gender distribution showed a slight female predominance (54.0%). A majority of participants were engaged in indoor occupations (62.3%), and most resided in an urban setting (71.7%). Notably, a significant majority reported low daily sun exposure, with 80.3% receiving less than 30 minutes per day, and 62.3% consumed fish less than twice a week. The most frequently reported clinical complaints were generalized fatigue (67.7%), bone or joint pain (59.3%), and muscle weakness (52.0%).

Laboratory assessment of vitamin D status indicated a high burden of deficiency, with 92.0% of participants exhibiting hypovitaminosis D. Specifically, 59.7% were deficient (serum 25(OH)D <20 ng/mL), 32.3% were insufficient (20-29.9 ng/mL), and only 8.0% were sufficient (≥30 ng/mL). The mean serum 25(OH)D level was 19.8 ± 7.6 ng/mL.

Statistical analysis demonstrated significant associations between vitamin D status and several modifiable and non-modifiable factors. Vitamin D deficiency was significantly more prevalent among males compared to females (66.7% vs. 53.7%, p=0.015), individuals with indoor occupations versus outdoor occupations (65.8% vs. 47.9%, p=0.001), those with low sun exposure (67.2% for <30 min/day vs. 28.8% for ≥30 min/day, p<0.001), and those with infrequent fish consumption (69.0% for <2 times/week vs. 44.2% for e”2 times/week, p<0.001). A significant association was also observed with residence, showing a higher prevalence of deficiency in urban residents (62.3%) compared to their rural counterparts (52.9%, p=0.045).

Table I

Characteristics of the Study Population (N=300)

Characteristics	Frequency (n)	Percentage (%)
Age (Years)		
18-30	102	34.0
31-45	118	39.3
46-60	62	20.7
>60	18	6.0
Mean Age ± SD=38.7 ± 12.4		
Gender	Frequency (n)	Percentage (%)
Female	162	54.0
Male	138	46.0
Occupation	Frequency (n)	Percentage (%)
Indoor (Office, Student)	187	62.3
Outdoor (Labor, Farming)	73	24.3
Housewife	40	13.4
Residence	Frequency (n)	Percentage (%)
Urban (Dhaka City)	215	71.7
Rural	85	28.3
Self-Reported Sun Exposure	Frequency (n)	Percentage (%)
<30 minutes/day	241	80.3
30-60 minutes/day	49	16.3
>60 minutes/day	10	3.4
Dietary Fish Intake	Frequency (n)	Percentage (%)
<2 times/week	187	62.3
e”2 times/week	113	37.7
Presenting Complaints	Frequency (n)	Percentage (%)
Generalized fatigue	203	67.7
Bone/Joint pain	178	59.3
Muscle weakness	156	52.0

Table II

Vitamin D Status of the Study Population (N=300)

Vitamin D Status	Serum 25(OH)D (ng/mL)	Frequency (n)	Percentage (%)
Sufficient	≥30	24	8.0
Insufficient	20 – 29.9	97	32.3
Deficient	<20	179	59.7
Overall Hypo vitaminosis D	<30	276	92.0
Mean ± SD		19.8 ± 7.6 ng/mL	
Range		3.5 – 52.1 ng/mL	

Table III

Association of Vitamin D Status with Selected Factors (N=300)

Factor	Category	Deficient (<20 ng/mL) n (%)	Insufficient (20-29.9ng/mL) n (%)	Sufficient (≥30ng/mL) n (%)	p-value
Gender	Female (n=138)	92 (66.7%)	37 (26.8%)	9 (6.5%)	0.015
	Male (n=162)	87 (53.7%)	60 (37.0%)	15 (9.3%)	
Occupation	Indoor (n=187)	123 (65.8%)	52 (27.8%)	12 (6.4%)	0.001
	Outdoor (n=73)	35 (47.9%)	30 (41.1%)	8 (11.0%)	
Sun Exposure	<30 min/day (n=241)	162 (67.2%)	67 (27.8%)	12 (5.0%)	<0.001
	≥30 min/day (n=59)	17 (28.8%)	30 (50.8%)	12 (20.3%)	
Fish Intake	<2/wk (n=187)	129 (69.0%)	49 (26.2%)	9 (4.8%)	<0.001
	≥2/wk (n=113)	50 (44.2%)	48 (42.5%)	15 (13.3%)	
Residence	Urban (n=215)	134 (62.3%)	67 (31.2%)	14 (6.5%)	0.045
	Rural (n=85)	45 (52.9%)	30 (35.3%)	10 (11.8%)	

Statistically significant (p<0.05)

Discussion

This hospital-based study reveals a critical public health issue: 92.0%of adult patients attending a tertiary care facility in Dhaka City had hypovitaminosis D, with 59.7% being frankly deficient. This prevalence is even higher than the 86% reported in a previous Bangladeshi study[4] and aligns with the global trend of high deficiency rates in sunny regions[26] Our findings underscore the severe magnitude of Vit D deficiency in the urban Bangladeshi population seeking healthcare.Consistent with global literature, female gender was a significant risk factor, with 66.7% deficiency compared to 53.7% in males (p=0.015). This disparity is likely multifactorial, attributable to indoor-oriented lifestyles, use of traditional skin-covering attire, and possibly physiological differences[27]. Occupation was another strong correlate; participants with indoor jobs had a 65.8% deficiency rate versus 47.9% in those with outdoor occupations (p=0.001), highlighting the pivotal role of limited sun exposure in an urban setting.Lifestyle factors were profoundly influential. Inadequate self-reported sun exposure (<30 min/day) was reported by 80.3% of participants and was strongly associated with deficiency (67.2%, p<0.001). This finding mirrors studies from other South Asian countries where cultural practices and urbanization limit UVB exposure[28].Patwardhanet. al. (2018) showed in their study that serum 25 (OH) D concentrations are significantly correlated with sunlight exposure.[29]Butprolonged sunlight exposure never produces extravagant Vit D3[30]. Ultra Violate Ray is more prevalent during the hours of 10 am to 3 pm. During spring, summer, and autumn, 10 to 15 min of sun exposure from 10 am to 3 pm can generate satisfactory Vit D in light-skinned populations. Perhaps, the epidermal melanin of darker-skinned individuals is required more denunciation for cutaneous Vit D synthesis. Likewise, it is reputed that Asians from the Indian subcontinent demand 3 times as much sun exposure as Caucasians since Africans might need 6 to 10 times more[31,32].Patwardhan et. al., (2018) found in their study that western Indian men living in an urban setting with dark skin required over 1-hour casual sunlight exposure between 11 am to 3 pm to assert serum 25 (OH) D concentration above 50 mmol[29].Similarly, low dietary intake of fish (<2 times/week), reported by 62.3%, was a strong predictor of deficiency (69.0%, p<0.001), emphasizing the poor dietary contribution to Vit D status in this population.Urban residence was associated with a higher prevalence of deficiency (62.3%) compared to rural residence (52.9%) (p=0.045). This urban-rural divide may be explained by higher levels of air pollution, greater time spent indoors, and different occupational and clothing pattern in the metropolitan environment[33].The clinical presentation was dominated by non-specific musculoskeletal symptoms: fatigue (67.7%), bone/joint pain (59.3%), and muscle weakness (52.0%). While these are classic signs of Vit D deficiency[34], their high prevalence in this study population reinforces the need for clinicians to have a high index of suspicion for hypovitaminosis D in patients presenting with such complaints, even in a sun-rich country.

Based on the cited research by Patwardhan et al. (2018), achieving optimal Vitamin D levels through sunlight alone is challenging, particularly for dark-skinned individuals in urban environments, who required more than an hour of midday sun exposure to reach a concentration of 50 nmol/L. This underscores that natural sun exposure is often an impractical primary solution for correcting Vitamin D deficiency in Bangladesh. Therefore, addressing this widespread public health issue demands urgent and proactive national measures. To effectively mitigate the problem, a multi-pronged strategy is essential. This includes scaling up accessible diagnostic capabilities across the country to ensure early detection, implementing nationwide public awareness campaigns about the consequences of deficiency, and initiating programs for dietary supplementation and food fortification. Furthermore, sustained investment in research is critical to fully understand the local epidemiology and health impacts of Vitamin D deficiency, fostering a collaborative effort between government, healthcare providers, and industry to improve population-wide Vitamin D status in Bangladesh.

Limitations

Being a hospital-based, cross-sectional study with purposive sampling limits generalize ability to the wider population. Self-reported data on sun exposure and diet are subject to recall bias. Causality between factors and Vit D status cannot be inferred.

Conclusion

This study confirms an alarmingly Vitamin D deficiency among adults seeking care at a tertiary hospital in Dhaka. The condition is significantly associated with female gender, indoor occupation, inadequate sunlight exposure, poor dietary habits, and urban living.

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Conflict of Interest:

None declared.

Ethical Approval

The ethical permission received from the ethics review committee of the institution – BIHS General Hospital, Dhaka. Confidentiality was strictly maintained during data processing and report writing.

Authors 'contributions

Dr. H N MasukRahman conceptualized and designed the study. Dr. H N MasukRahman and Dr. Abul Khair Ahmad Zaman were involved in data acquisition, analysis, and interpretation. Dr. H N Masuk Rahman drafted the initial manuscript. Dr. AbulKhair Ahmad Zaman and Dr. AsifulHaque revised the manuscript critically for important intellectual content. Dr. Mohammed Arman assisted in data collection and interpretation. All authors read and approved the final manuscript and agree to be accountable for all aspects of the work.

Data availability statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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