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Original Research Article

Status of vitamin D and disease pattern among sedentary adults 18-60 years attending a selected institution in Dhaka city

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ABSTRACT

Background: Vitamin D deficiency is a global health concern affecting individuals across all the age groups in both the genders. It is an essential element that is essential for the production, regulation and absorption of calcium and phosphorus by the human body, as well as for the proper maintenance of teeth and bones and to make your immune system work. Vitamin D is not actually a vitamin; it falls under the pro-hormone category. Because the human body is perfectly capable of producing vitamin D on its own when exposed to sunlight, and vitamins are the type of nutrients that the body cannot or cannot produce automatically, that we consume through dietary supplements.
Methods: It was a cross sectional study the sample size was 369. Vitamin D level of all the participants was estimated by using an ADVIA Centaur XPT stem designed to perform continuous operations immunoassay methods. The data were processed to undergo statistical analysis using SPSS 23 windows program. Microsoft Word, Microsoft Excel were used to represent the tabular, charts and graphical icon.
Results: The prevalence of vitamin D deficiency exhibited a medical condition increment in both the males and females. This study had clear association was observed using bivariate analysis for any of the three chronic conditions such as hypertension, cardiovascular disease and osteomalacia where (p=0.021), (p=0.039) and (p=0.000) explored in the current study with severe deficiency status.
Conclusions: Vitamin D deficiency was prevalent even in apparently healthy young individuals; this study is suggestive of a higher prevalence of vitamin D deficiency among young adults, females, Bangladeshi nationality and those with higher BMI.

Keywords: Body Mass Index, Vitamin D, Higher secondary certificate, Medical condition, Sedentary adults

INTRODUCTION

Vitamin D is also known as the sunshine vitamin, and it is an essential element that is essential for the production, regulation and absorption of calcium and phosphorus by the human body, as well as for the proper maintenance of teeth and bones and to make your immune system work, which is diabetes, can fight diseases like multiple sclerosis, or hardening of the arteries, and cancer. Vitamin D is not actually a vitamin; it falls under the pro-hormone category. Because the human body is perfectly capable of producing vitamin D on its own when exposed to sunlight, and vitamins are the type of nutrients that the body cannot or cannot produce automatically, that we consume through dietary supplements.[1]

Diet also plays a role on vitamin D status.[2] The major dietary sources of vitamin D are milk, plant-based beverages, fortified fruit juices and yogurts.[3] Vitamin D deficiency can have serious consequences on health and is a widely spread micronutrient problem globally. Several risk factors are associated with low serum levels

of vitamin D in adults. These include advancing age, female gender, clothing style, season, socioeconomic status, urban living, dark skin and body mass index (BMI).[4,5] Vitamin D deficiency has been reported as a public health concern globally.[6] While high prevalence of vitamin D deficiency has been reported globally, reliance on a single cut-off value to define vitamin D deficiency or insufficiency is problematic because of the wide individual variability of the functional effects of vitamin D and interaction with calcium intakes.[6] Recently, vitamin D as a micronutrient and its deficiency has become more popular among the medical community as well as the public. Vitamin D deficiency in known to cause bone diseases in adults.[7,8] A study showed a positive correlation between bone mineral density values at both lumbar spine (L_1-L_4) and neck of femur and serum vitamin D levels, respectively.

Apart from the well-established effect of vitamin D deficiency on diseases associated with bone growth, there is a wide array of other risk factors and medical conditions which in literature provide conflicting evidence of being associated with vitamin D deficiency. Vitamin D deficiency was found to be common among obese men with no education and sedentary lifestyle in a community Nutrients and vitamins are very important for our body. However, due to work, many people neglect their daily diet, due to which vitamins are not available in the body.

METHODS

Study design

A cross sectional study design was chosen for this study.

Study place and population

The study was conducted the department of biochemistry of a diagnostic center of Dhaka city. Data were extracted from the database. All the patients who were referred to the center for vitamin D estimation during the study period were purposively included.

Study duration

Study took place from March 2022 to September 2022. The study was started with protocol preparation and finished with final report submission.

Sampling technique and sample size

The simple random sampling technique was applied to sort the vitamin D deficiency for the study continuation. Simple random sampling technique was used to select participants based on the inclusion and exclusion criteria. Since some studies claim the status of vitamin D among sedentary adults 18-60 years attending a selected institution Ibn Sina Diagnostics and consultation center in Dhaka city, we took sample size of 369 persons using the formula.

$n= pqz^2/d^2$, where p=expected proportion of in population based on previous studies and is equal to 35%. (https://iedcr.gov.bd/nbph/issue-sections/c751921d-9a59-4f55-a729-7675ac25d3d0), q=1-p =65%. z (standard normal deviate) = 1.96 (at 5% error), d= absolute error or precision and is equal to 5%.

So, $n= 35\times65\times (1.96)^2/ (5)^2 =350$ and after considering 5% non-response rate, our final sample size was 350/0.95 =369.

Inclusion criteria

Sex: both male and female, age ≥18-60 years, those willing to participate.

Exclusion criteria

Patients >60 years, too ill to participate or unwilling to participate.

Data collection techniques

A planned questionnaire was developed containing both the closed and open-ended query to collect data through face to-face interview with the respondents. The questionnaire was pretested in areas far away from the sample areas and revised according to the feedback gained in the field level. The questionnaire was formed to obtain the relevant information considering personal, household, social and economic details, dietary patterns, general behaviour's, anthropometric assessments and interrelation between different variables.

Biochemical analysis procedure

The individuals are tested for vitamin D serum levels if requested by a doctor. The tests are conducted in diagnostic center laboratories. Blood drawn from an individual by a phlebotomist was processed using an ADVIA Centaur XPT immunoassay system designed to perform continuous operations immunoassay tests, supports comprehensive diagnoses with a menu of over 70 assays detection technology. The results of the test were recorded by the laboratory EMR system. Data were extracted from the diagnostic center of pathology department EMR system for the defined study population. The data was extracted for a time period of 6 months starting from 1 March to 31 August 2022. A total of 369 adults (aged 18-60 years old) accessed of Ibn Sina consultation center.

Nutritional status assessment

The nutritional statuses of the respondents were assessed using measured BMI of the respondent by means of the following formula:

BMI = body weight in kg / (body height in m)^2

Quality assurance of data

The questionnaire was checked per day taking the interview and again these were carefully rechecked after collecting all the data and coded prior the entrancing into computer technology. The data was edited in case of sighting discrepancy (doubt entry, wrong entry etc.).

Data analysis

The data were processed to undergo statistical analysis using SPSS 23 windows program. Microsoft Word, Microsoft Excel were used to represent the tabular, charts and graphical icon.

RESULTS

Socio-demographic characteristics

In this study, more than (32.5%) of the respondent were within the age group of 31-40 years, among them male (54.4%) were predominant. In terms of education, about 50.1% respondent had HSC and above.

Occupation showed that more than half of respondent were still no job (26.6%) and free business (24.3%). Family income showed that more than 41.2% of the respondent was family income group were 35000-70000, among the respondents 65% were from urban area and the rest 35% were from rural area (Table 1).

Table 1: Socio-demographic characteristics of the respondents (n=369).

Variables	Number	Percentage
Age (mean±SD)	92.2±22.06	
Age group (years)		
18-30	70	18.9
31-40	120	32.5
41-50	80	21.7
51-60	99	29.9
Gender		
Male	201	54.4
Female	168	45.6
Level of education		
Non-educated	12	3.2
Primary school	65	17.6
SSC	107	28.9
HSC and above	185	50.1
Occupation		
Government job	43	11.6
Private job	50	13.6
Free business	90	24.3
No job	98	26.6
Teaching	38	10.3
Farming	45	12.3
Disable	5	1.3
Monthly family income (mean±SD)	70.11±40.30	
Family income grouping		
15000-30000	80	21.7
35000-70000	152	41.2
75000-100000	72	19.6
120000-300000	65	17.7
Residential area		
Urban	240	65
Rural	129	35

Table 2: Frequency distribution of body mass index among the respondent (n=369).

BMI	Frequency	Percentage
Acceptable (<25)	82	22.3
Overweight (25-29.9)	121	32.7
Grade 1 or low risk obesity (30-34.9)	102	27.6

Grade 2 or moderate risk obesity (35-39.9)	44	11.9
Grade 3 obesity (morbid obesity) (40+)	20	5.5
Total	369	100

Body mass index (BMI) status

The study results were based on the analysis of (n=369) where 121 (32.7%) had overweight, 120 (27.6%) were obesity grade 1 (Table 2).

Vitamin D status

Out of total 369 respondent, majority 140 (37.9%) vitamin D deficiency (serum level <20 ng/ml), of them were 108 (29.3%) A second cut-off value for defining vitamin D insufficiency is set at <30 ng/ml and 70 (18.8%) were normal 30-40 ng/ml (Figure 1).

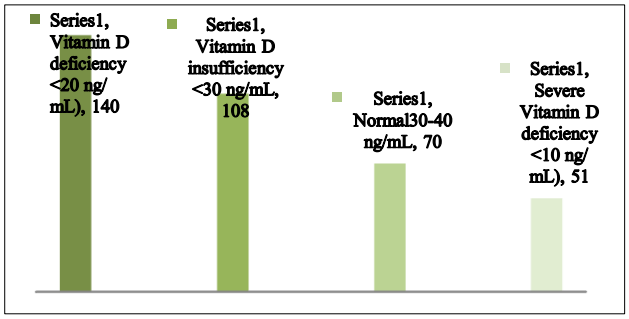

Figure1: Distribution of the respondents by vitamin D status (n=369).

Table 3: Association between vitamin D deficiency and some medical conditions in persons aged 18-60 years.

Variables	Vitamin D status				
Medical condition	**Vitamin D deficiency <20 ng/ml**	**Vitamin D insufficiency <30 ng/ml**	**Normal 30-40 ng/ml**	**Severe vitamin D deficiency <10 ng/ml**	**P value**
Diabetes	21 (5.7)	15 (4)	10 (2.7)	8 (2.1)	0.576
Hypertension	17 (4.6)	20 (5.4)	22 (5.9)	5 (1.3)	0.021
Cardiovascular disease	13 (3.5)	18 (4.8)	18 (4.8)	6 (1.6)	0.039
Osteomalacia	40 (10.8)	28 (7.5)	5 (1.3)	22 (5.9)	0.000
Asthma	15 (4)	12 (3.2)	10 (2.7)	4 (1)	0.638
Dyslipidemia	30 (8.1)	15 (4)	5 (1.3)	10 (2.7)	0.538

Association between vitamin D deficiency and some medical conditions in persons aged 18-60 years

Table 3 represented that most respondents were significant medical condition such as hypertension, cardiovascular disease and osteomalacia where (p=0.021), (p=0.039) and (p=0.000).

Results were expressed as number (%), χ^2 was performed and p<0.05 was level of significance and <0.01 was level of highly significance.

DISCUSSION

In present study showed that 120 (32.5%) were in 31-40 years age group followed by 99 (29.9%) in 41-50 years age group (Table 1).

In similar study of Zainel et al vitamin D status among adults (18-65 years old) attending primary healthcare centres in Qatar represent 30-32 years of age group 30889 (30.2%).[9]

This study represented out of 369 majority 201 (54.4%) of them were male and the rest 168 (45.6%) were female (Table 1). Out of 793 subjects, 269 (33.9%) were male and 524 (66.1%) were female.[10]

The high majority 140 (37.9%) vitamin D deficiency (serum level <20 ng/ml), of them were 108 (29.3%). A second cut-off value for defining vitamin D insufficiency is set at <30 ng/ml of vitamin D deficiency observed in the current study is comparable to that found in various subpopulations of the Middle Eastern as well as to that found in Qatar (Figure 1).

A systematic review of evidence in Qatar reported the weighted-average prevalence of vitamin D insufficiency of 90.4%.[10] Another systematic review found that severe vitamin D deficiency (<10 ng/ml) was most common in South Asia and the Middle East.[11] The prevalence of vitamin D deficiency in UAE was 85.4%.[12] In another study from Saudi Arabia conducted on adult males aged 20-74 years old, 87.8% had vitamin D level <20 ng/ml.[9] Similar reports of high prevalence of vitamin D deficiency and insufficiency status were also reported for Jordanian and Moroccan women.[11,13] Globally, vitamin D

insufficiency is prevalent in all regions of the world. In the USA, the overall prevalence rate of vitamin D deficiency (≤20 ng/ml) was 41.6% among adults, with the higher rates in Blacks (82.1%) and Hispanics (69.2%).[15]

Our study reports highest prevalence of severe vitamin D deficiency among obese individuals. In addition, a positive trend for severe vitamin D deficiency was observed with increasing BMI. Many studies supported the fact that low serum vitamin D levels are significantly more common among obese people with BMI>30.[9,15-17] Obesity-associated low vitamin D levels is possible due to the decreased bioavailability of vitamin D from cutaneous and dietary sources among obese people.[18]

None of the six chronic conditions explored in the current study (diabetes, hypertension, asthma, dyslipidemia, cardiovascular and osteomalacia) had an obvious association with severe vitamin D deficiency status in bivariate analysis.

The multivariate modeling, however showed that (adjusting for age, gender, BMI and nationality and each of the included chronic conditions) hypertension, cardiovascular diseases and stroke increased the risk of having an associated severe vitamin D deficiency status. Whereas, diabetes and asthma were associated with a lower probability of having an associated deficiency status. There is an abundance of literature discussing the association between these chronic conditions and vitamin D status. Some suggested that vitamin D plays an important role in a broad range of organ functions, including cardiovascular health and thus a deficiency status would be associated with a significant increase in the prevalence of vascular disease, coronary artery disease, myocardial infarction, heart failure and stroke. This plausible explanation fora beneficial role of vitamin D in preventing or ameliorating the above listed conditions was consistently challenged by another group of literature failing to document a link between these conditions and vitamin D.

Emphasis was given on the correct procedure of data collection and its manipulation. However, the study is not free from the following limitations: Due to time restriction this study includes only one diagnostic center. It was difficult to cover most respondent within this short period of time. This study is conducted with limited resources, it makes impossible to include many important question and variables. Since the study conducted in outdoor service the results may be distorted by information bias.

CONCLUSION

Vitamin D deficiency was prevalent even in apparently healthy young individuals; this study is suggestive of a higher prevalence of vitamin D deficiency among young adults, females, Bangladeshi nationality and those with higher BMI. This study had clear association was observed using bivariate analysis for any of the three chronic conditions such as hypertension, cardiovascular disease and osteomalacia where (p=0.021), (p=0.039) and (p=0.000), explored in the current study with severe deficiency status.

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