Chattogram Maa-O-Shishu Hospital Medical College Journal
Volume 20, Issue 2, July 2021

Original Article

Vitamin D Deficiency and Associated Factors in Adult Females of Chattogram

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Abstract

Background : *Vitamin D is an essential nutrient and deficiency of it leads to devastating disorders. This study aimed to find out the associated factors with selected variables of low vitamin D among adult females of Chattogram.*

Materials and methods : *Cross-sectional observational study was conducted from September 2019 to February 2020 at a diagnostic complex of Chattogram. Participants were adult females of Chattogram. All participants gave oral informed consent and answered a questionnaire that included 16 questions covering demographic information, monthly income, educational status, occupation, body weight, duration of sun exposure, dress pattern (Using hijab or burkha, regular dress-up) drug and disease history. Blood samples were collected by cautious aseptic procedure. Serum vitamin D levels were measured by using immunoassay method. Adult females of Chattogram with no religious restrictions, n= 150,aged 31 to 70 years.*

Results: *Overall, 88% had low vitamin D levels with deficient 60.66% and insufficient 27.34%. Sufficient level of vitamin D was found only among 12%. The prevalence of vitamin D deficiency was much higher in females with house-wife status 73.33% (p value of 0.0001) wearing hijab 46.66% (p value of 0.001). It could be due to interference with UVB radiation into skin, short duration of sun exposure, use of sunblock cream or less supplementary intake.*

Conclusion : *Vitamin D deficiency is an emerging but neglected health issue in modern time, particularly more vulnerable are female population. Ironically, abundant sunlight of Bangladesh seems failed to protect the self-imposed concrete prisoner, classically known as home-makers, and practitioner of indoor life style that leads to avoidance of sun light. However, large sample size is mandatory to boost-up the findings of current study.*

Key-words: Chattogram; Females; Vitamin D deficiency.

INTRODUCTION

There are two forms of vitamin D, Vitamin D_2 (Ergocalciferol) and Vitamin D_3 (Cholecalciferol). Vitamin D_3 is derived from ultraviolet sunlight exposure or from oily fish or supplements[1,2]. Vitamin D, that is synthesized in skin needs two steps of hydroxylation in the liver and kidney to form the biologically active form of vitamin D, $1,25(OH)_2D$[2]. 1,25 – dihydroxy cholecalciferol (Calcitriol) binds to Vitamin D Receptors (VDRs) that are sited in many cells of the body, and then it is ready for biological action[3].

Vitamin D is the essential nutrient needed very much for regulation of calcium and phosphorous. Intestinal calcium absorption is eventually facilitating bone mineralization[4]. It helps in regulation of muscular strength and function[5]. It also strengthen immunity[6]. It is vital for inhibition of cellular proliferation and induction of terminal differentiation, inhibition of angiogenesis, stimulation of insulin production, inhibition of renin production and stimulation of macrophage cathelicidin production[7].

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Date of Submission : 11.05.2021
Date of Acceptance : 15.06.2021

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Vitamin D deficiency is now acknowledged as a common health problem for general population[8]. Deficiency of Vitamin D plays a vital role in metabolic bone disorders such as osteomalacia in adults and rickets in children[9]. Low levels of vitamin D is related to many chronic diseases such as autoimmune diseases, cardiovascular diseases, hypertension, diabetes mellitus, metabolic syndrome, depression, cancer, neurocognitive function and increased susceptibility to infection[10].

According to the National Osteoporosis Foundation (NOF) vitamin D requirement for adults under the age of 50 is 400 – 800 IU/ day and age 50 and above is 800 – 1000 IU/ day[11]. Majority agree that a Vitamin D concentration less than 50 nmol/L or 20 ng/ml is an indication of vitamin D deficiency, 51 – 74 nmol/L or 21 – 29 ng/ml is considered as insufficiency and 30 ng/ml or more indicates sufficiency[12]. Vitamin D intoxication usually does not happen until the level reaches up to150 ng/ml[13].

Main source of vitamin D is exposure of the skin to sunlight(ultra violet A rays and ultra violet B rays), under normal condition skin is able to supply 80 – 100% of vitamin D requirement of body[11]. Exposure of the skin to sunlight usually between 1000 h and 1500 h in the spring, summer and fall is sufficient to produce vitamin D. Vitamin D produced in the skin may remain in the blood for a longer time than the ingested vitamin D (At least twice the duration).[3]In tropical country like Bangladesh, during summer time exposure to sunlight for about 10 – 15 minutes per day , two to three times per week is adequate for effective vitamin D formation in the skin[11]. Other studies proved that human body can intake most of their vitamin D requirement from 5 – 30 minutes of direct sunlight when sun is at high in position[14].

Consumed animal products such as salmon, tuna, sardines, fish liver oils, beef liver, cheese, egg yolks contain vitamin D[15]. Some foods such as milk, soy or rice beverage, yogurt and cheese are fortified with vitamin D[16].

Skin derived synthesis of vitamin D depends on pigmentation, latitude, season, clothing, age, sunscreen use and local weather conditions[17]. Anything that prevents penetration of sunlight into skin can reduce vitamin D synthesis in the skin. People live in norther half of the United states and Canada are at high risk of vitamin D deficiency, because their climate hinders production of sufficient sunlight. Vitamin D deficiency also found in sunny climates for many reasons, like wearing sun block, increased skin pigmentation, fat malabsorption syndrome, patient with nephrotic syndrome (Lose vitamin D through excretion of vitamin D- binding protein in the urine)[14]. Drugs like anti-seizure medications and long-term glucocorticoids use decreases serum vitamin D level[18]. Limited exposure to sunlight, covering whole body for religious or cultural reasons while outing (Religious dress for Muslim adult females) may result into limited exposure to sunlight[19-21]. Many studies have been conducted on Muslim females regarding this issue, and results found significant level of vitamin Dinsufficiency or deficiency[21-23].

This study was done to assess the vitamin D status among adult females of Chattogram and to evaluate the relation between vitamin D levels and duration of sunlight exposure, occupational identity, using religious dress that covers almost whole body (Except face and hands).

MATERIALS AND METHODS

A cross-sectional observational study was conducted from September 2019 to February 2020 at a diagnostic complex of Chattogram. Participants were adult females of Chattogram with no religious restrictions. Total respondents were 150, age between 31 and 70 years. All participants gave oral informed consent and answered a questionnaire that included 16 questions covering demographic information, monthly income, educational status, occupation, body weight, duration of sun exposure, dress pattern (Using hijab or burkha) drug and disease history. Blood samples were collected by cautious aseptic procedure. Serum vitamin D levels were measured by using immunoassay method. Data were managed with SPSS version 20.

Inclusion criteria:

Patients with symptoms of no gross vitamin D deficiency, willing to participate in the study.

Exclusion criteria:

Patients with vitamin D supplementation or treatment, hepatic and renal impairment, congenital anomalies, malabsorption syndrome, pregnant and lactating mother.

RESULTS

Total number of respondents were 150, aged 31 to 70 years. 75 women with usual dress and 75 with burkha. Overall, 88% had low vitamin D levels with deficient 60.66% and insufficient 27.34%. Sufficient level of vitamin D was found only among 12%. The prevalence of vitamin D deficiency was much higher in females with house-wife status 73.33% (p value of 0.0001) wearing hijab 46.66% (p value of 0.001).

There was no significant association found between different age groups but religious norms like wearing hijab or covering whole body (Except face and hands) matters significantly [Table I].

Table I : Age of the Respondents

Age Group	Regular dress	Whole body covering attire over regular dress	p value
31 – 40 years	33	28	
41 – 50 years	27	36	p = 0.68
51 – 60 years	14	10	
61 – 70 years	01	01	

Source: Study report 2020

Major educational qualification among the respondents was at the stage of secondary to higher secondary level (Class X- XII) with the number of 59 out of 150 [Table II].

Table II : Educational status of the Respondents

Grade	Regular dress	Whole body covering attire over regular dress
< Class X	23	25
Class X - XII	32	27
>Class XII	20	23

Source: Study report 2020

Regarding occupation, most of them were house wives with a percentage of 73.33%, in this group majority preferred hijab for their outing with p value of 0.0001. It is important in context to our study because their sun exposure was less than that of regular dressed-up group (Non-hijab group) [Table III].

Table III : Occupation of the Respondents

Occupation	Regular dress	Whole body covering attire over regular dress	p value
Home maker or house wife	42	68	p = 0.0001
others	33	07	

Source: Study report 2020

Monthly family income of the study population showed that majority of the families earned between 20,000 and 30,000 BTK per month. Family income of the women with regular outfits wasmore than the other group [Table IV].

Table IV : Monthly Family incomeof the Respondents

Income	Regular dress	Whole body covering attire over regular dress
< 20,000 BTK	27	33
20,000 -30,000 BTk	41	38
>30,000 BTK	07	04

Source: Study reports 2020

Significant result showed in the table pointing vitamin D status of the respondents. Majority of them were suffering from vitamin D deficiency with the number of 62 out of total 150. This group chose themselves to cover with religious clothing like hijab for their outdoor activities. It has been shownthat vitamin D level of whole body covering (except face and hands) group was less than the group wearing regular social get-up with p value of 0.001. It could be due to less sun exposure for their life style [Table V].

Table V : Vitamin D status of the Respondents

Vitamin D Status	Regular dress	Whole body covering attire over regular dress	p value
Deficient	29	62	p = 0.001
Insufficient	33	08	
Sufficient	13	05	

Source: Study reports 2020

DISCUSSION

It is now well proved that low levels of vitamin D are linked with devastating disorders. Commonly reported factors associated with decreased vitamin D level are, higher skin pigmentation, less vitamin D fortified foods, cultural customs such as whole-body covering attire that leads to avoidance of direct exposure to sun light, low vitamin D supplementation[24]. Darker skin blocks UV radiation significantly and thereby decreases vitamin D production (People with dark skin may need 20-30 times as much exposure to sun light)[25]. Excess adipose tissue of women than the men suggested to lower vitamin D concentration in female[26].

In this study, total number of respondents were 150, aged 31 to 70 years. Overall, 88% had low vitamin D levels with deficient 60.66% and insufficient 27.33%. Sufficient level of vitamin D was found only among 12%. The prevalence of vitamin D deficiency was much higher in females with house-wife status 73.33% (p value of 0.0001) wearing hijab 46.66% (p value of 0.001). There was a study among female students of UAE college which is consistent with our study. It recorded vitamin D deficiency among around 48% of the students, particularly in students wearing hijab, around 38%, which might have interference with UVB radiation into the skin[27]. This problem could be due to avoidance or limited exposure to sunlight. The most suitable time for sun exposure for maximum vitamin D synthesis is between 10am and 1pm. The use of sun blockers with variable sun protection factors (SPF 25 – 100) prevent the body's capability to synthesize vitamin D by approximately 93% to 99%[27]. There are many studies linked with vitamin Ddeficiency in females wearing conservative clothes with a cover[28-31]. Ultra-Orthodox Jewish women, who used to cover their heads for religious reasons, are also at high risk of vitamin D deficiency[27]. Only one study so far we found, that speaks totally opposite of these findings. This study found no significant difference of vitamin D levels between hijab users and non-users[11]. Vitamin D also acquired from natural dietary sources like fatty fish, fish oil and eggs, from fortified products (Such as milk and orange juice) and from supplements[2]. An earlier study found that up to 47% of vitamin D input may be from dietary supplements[32].

A Saudi Arabian study found that in spite of sufficient nutritional intake and regular exposure to UV sunlight, there were marked deficiency in serum vitamin D levels. It was explained by genetic predisposition to vitamin D deficiency among Saudi Arabians. This study also reported high prevalence of vitamin D deficiency in Asian population living in United Kingdom. So it is hypothesized that these is a genetic predisposition to vitamin D deficiency among Asians[33]. Vitamin D deficiency is highly prevalent in Pakistan, India, Bangladesh, Nepal, Sri Lanka, Myanmar and Bhutan due to their geographical and socioeconomic cultural similarity[34,35]. Aforesaid problems can be solved with appropriate amount of vitamin D supplementation added with daily exposure to the Sunlight in the privately owned area, where there is no chance to breach religious restriction and by reducing the use of sun-screen while outing.

CONCLUSION

Our study is the continuation of the findings of many other previous studies those found significant vitamin D deficiency among adult women particularly due to less sun exposure that related to multiple factors like occupation, duration of sun exposure and life style in term of dress-up. But limitation of this study was small sample size. Large scale study is needed to establish the findings of the present study.

DISCLOSURE

All the authors declared no competing interest.

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