Original Article

Socio-demographic Determinants of Hypovitaminosis D

Rahman AHMH[1], Zafreen F[2], Nazneen L[3], Wahab MA[4]

DOI: https://doi.org/10.3329/jafmc.v14i2.45902

Abstract

Introduction: Hypovitaminosis D is a silent but very devastating health issue throughout the world. Socio-demographic factors have some role on the issue.

Objectives: To determine the sociodemographic determinants of hypovitaminosis D among the clients attending specialized hospitals.

Materials and Methods: This cross-sectional study was conducted among 264 respondents attended the Armed Forces Institute of Pathology, Dhaka Cantonment for estimation of 25(OH) D within the period of July 2017 to June 2018.

Results: Respondentsmeanage was 48.23±14.05 years and themajority (68.56%) were female among themhalf (49.72%) were menopausal. All the clients were educated and majority (68.18%) had crossed the level of higher secondary. The mean ± SD of monthly family income was Taka 68824.46±23.92 and majority (57.57%) were from higher socioeconomic group. A large portion (47.35%) of the respondents was housewives followed by (26.56%) government employee. The mean± SD level of 25(OH) D of total population was 50.01±29.93 nmol/L butamong the male and female it was 50.86±28.61 nmo/L and 49.60±26.19 nmol/L respectively. Menopausal women (48.03±28.11 nmol/L) had significantly($p < 0.05$) less vitamin D than non-menopausal women (52.32±23.96 nmol/L) butupper-income group (52.47+23.12 nmol/L) found significantly ($p < 0.05$) higher vitamin D than lower socioeconomic group (46.32+16.78 nmol/L). The fare skinned respondents (54.46 + 28.24 nmol/L)) had significantly($p<0.01$) higher level of vitamin D than dark-skinned persons (42.59 + 16.79 nmol/L). The overall hypovitaminosis D was 84.84%.

Conclusion: The prevalence of hypovitaminosis D was too high and sociodemographic determinants have a significant impact on vitamin D level. Effective measures need to be taken at all level to overcome nutritional disorder.

Key-words: Vitamin D, Socio-demographic determinants, Sunlight.

Introduction

Vitamin D deficiency is common worldwide irrespective of its occurrence in both high and low-latitude countries. In addition to the European countries, vitamin D deficiency has been reported in many countries in the Middle East, Africa and Asia. Surprisingly, it is more frequent in the sunny Mediterranean countries than in certain northern countries such as Norway. A high prevalence of vitamin D deficiency, low dietary intake of calcium was observed in premenopausal Bangladeshi women of both high and low socioeconomic statuses. Their lifestyle largely confining them to the home and the traditional clothing that Bangladeshi women wear exposes very little of their skin to sunlight. Under these conditions, women in different groups are at risk of developing vitamin D deficiency[1]. Despite ample amount of sunshine in Bangladesh vitamin D deficiency is present in a sizeable share of the general population which in itself seems to be a paradox[2]. This sub-continent receives plenty of sunshine all year round and thus people in this area should not lack vitamin D. An insufficient exposure to sunlight is the main cause of vitamin D deficiency[3]. With the achievement in increasing life expectancy, issues originated from vitamin D deficiency is also playing serious role in our daily life. Though many of our population are suffering from different types of problem including unusual pain, there is very less study conducted on this topic in Bangladesh. With this proposal, this study tried to explore some key socio-demographic determinants of vitamin D of public health interest. Determinants are:

Skin pigmentation-many factors reduce the skin's production of vitamin D[3], including increased skin pigmentation, ageing, and the sun protection behaviours such as application of a sunscreen or cover most part of their bodies with clothes[4]. Vitamin D synthesis is highly dependent on the concentration of melanin in the skin as melanin absorbs and scatters UVR-B, resulting in a less efficient conversion of 7-dehydrocholesterol to pre-vitamin D[35]. Therefore, dark-skinned individuals will experience slower vitamin D synthesis than light-skinned ones[6].

Age-in general, the cutaneous production of vitamin D declines with age[7]. Elderly usually stay indoors for prolong periods of time and have limited physical activity due to multiple co-morbidities, which further contribute to less sun exposure. Interestingly, elderly in Southeast Asia such as Thailand and Korea have a better vitamin D status when compare with younger people. The possible explanation is these elderly have more free time and spend time doing outdoor activities[8].

1. **Lt Col Abu Hasanat Md Habibur Rahman**, MBBS, MPH, MPhil, Commanding Officer, CMH, Momenshahi (*E-mail:* habib03r@gmail.com) 2. **Dr Farzana Zafreen**, MBBS, MPH, Associate Professor & Head, Department of Community Medicine, Medical College for Women and Hospital, Uttara, Dhaka.3. **Lt Col Lubna Nazneen**, MBBS, DCP, MCPS, FCPS, Classified Specialist in Pathology, AFIP, Dhaka 2. **Lt Col Md Abdul Wahab**, MBBS, MD, Associate Professor of Biochemistry, AFMC, Dhaka.

Gender- higher level of vitamin D is found among the female population than male same geographical and cultural areas,especially in western countries. But the situation was reversed in Muslim countries or the area where women put on cloths covering whole body[2]. Women have often many potential factors for having lower level of Vitamin D. Those are composition of body fat, less exposed to sunlight, less chance of physical activity, dietary constrain in country like Bangladesh[9]. Menopausal state- age is a crucial factor in determining cutaneous synthesis of vitamin D. Ageing affects multiple steps of vitamin D metabolism as ageing skin has reduced efficiency to synthesize vitamin D upon exposure to sun[10]. Therefore, post-menopausal women are more vulnerable to vitamin D deficiency owing to their inevitable ageing process coupled with obesity. Religion and cultural behaviour- the variation of vitamin D status in people who live in the same city or country is partly linked to religious, lifestyle and nutritional difference. There was a report that only one-third of participants were vitamin D sufficient [25(OH)D ≥ 50 nmol/L] in Malaysia which is a tropical country located at the equator and is sunny all year round. Most of the populations are Muslim. It's not surprising that the lower 25(OH)D levels were found in females, explained by the tradition costume (wearing long sleeves, long skirts and veil)[11]. Air pollution-the pollutants present in our surroundings efficiently absorbs UVB radiation and thus reduces the amount that reaches the earth's surface. This phenomenon may partially explain why residents of big cities such as Bangkok (Thailand), Delhi (India) had the lowest 25(OH)D concentration when compared with other cities/area in those countries[12]. Latitude and season-countries near to the equator receive more sunlight all year round compare with those far from the equator. In this area people are supposed to have better level of vitamin D[13].

Materials and Methods

A cross-sectional study was carried out to identify the socio-demographic determinants of Hypovitaminosis D. A total of 264 young adults were enrolled fromJuly 2017 to June 2018 from the Biochemistry laboratory of AFIP. Information on sociodemographic factors including education and income were obtained by self-reported questionnaires. Vitamin D level was categorized as Sufficient (≥75 nmol/L), Insufficient (50-74 nmol/L), Deficient (25-49 nmol/L) and Severe Deficient (<25 nmol/L). Any value less than 75 nmol/L considered ashypovitaminosis D for this study. Ethical clearance of the study was approvedbyInstitutional Review Board of NIPSOM. Written permission was taken from appropriate authority ofNIPSOM and AFIP. The respondents were briefed about the purpose of interview and written consent was taken.Data were analyzed by SPSS version 23. Statistical significance was done by chi-square test, One-way ANOVA and t-Test in specific issues.

Results

A total of 264 clients were interviewed among the reported for 25 (OH)D estimation. The study revealed the following findings with respect to socio-demographic characteristics of the respondents (Table-I). In this study, 40(15.16%) was found having sufficient level of vitamin D, Total 63(23.86%) was found insufficient, 129(48.86%) was deficient and 32(12.12%) were found having severely deficient. Total hypovitaminosis D proportion was 224(84.84%) (Figure-2). The mean level of vitamin D was clearly different between two groups of same variable. Male had slightly raised vitamin D level than female. Menopausal women had less vitamin D level than that of reproductive age. Respondents living in dusty area had lower level of vitamin D than those living in dust-free area. Persons working in outdoor had higher level of vitamin D than those working at office or indoor area. Most of the findings are statistically significant (p<0.05) (Table-II). Hypovitaminosis D was highest (97.3%) among the respondents living in industrial area. It was lowest (80.7%) among the city dwellers. This association was statistically significant (p<0.05) (Table-III). Among fare complexion respondents, vitamin D was significantly (p <0.01) higher (54.46 nmol/L) than that of dark-skinned respondents (42.59 nmol/L) (Table-IV).

Table-I: Socio-demographic factors of the respondents

Variable	Group	Frequency	Percentage
Gender	Male	83	31.44
	Female	181	68.56
Religion	Muslim	251	95.00
	Non- Muslim	11	5.00
Education Status	SSC	84	31.82
	HSC	67	25.28
	Graduate	75	28.78
	Postgraduate	38	14.0
Marital status	Married	214	81.06
	Unmarried	19	7.20
	Widow/widower	27	10.22
	Separated	4	1.56
Menopausal state (F)	Menopausal	90	49.72
	Non-menopausal	91	50.28
Age (years)	**Mean±SD: 48.33±12.45,**	**Range: 18-80**	

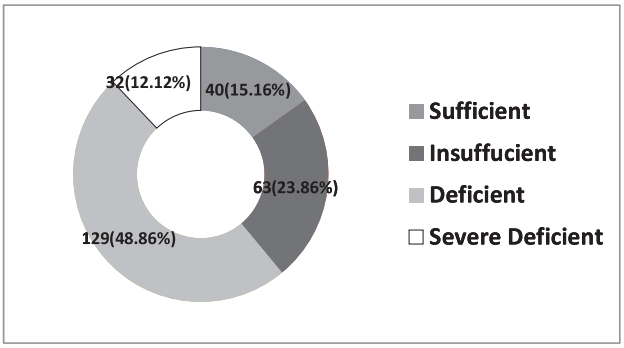

Figure-1: Distribution of hypovitaminosis D among the respondents (n=264)

Table-II: Relation of socio-demographic variables with mean vitamin D level (n=264)

Variable		Frequency (%)	Mean+ SD vit D (nmol/L)	t Score	p Value
Gender	Male	83(31.44)	50.86+28.61	0.350	0.726
	Female	181(68.56)	49.60+26.19		
Menopausal state	Menopausal	90(49.72)	48.03+28.11	-1.363	0.007
	Non-menopausal	91(50.28)	52.32+23.96		
Presence of dust	Present	43(19.20)	44.88+17.62	-2.449	0.015
	Absent	221(80.80)	51.00+28.07		
Job pattern	Office job	210(79.55)	47.90+24.31	4.455	0.001
	Outdoor job	54(20.45)	58.15+31.78		
Type of family	Nuclear	157(59.47)	51.24+29.23	0.905	0.366
	Combined	107(40.53)	48.18+23.14		

Table-III: Distribution of hypoviatminosis D by type of living area (n=264)

Type of living area	Presence of hypovitaminosis D		Test of significance
	Present	Absent	
Town/city	142(63.39%)	34(85.0%)	χ^2=7.971 df=2 p= 0.019
Industrial area	36(16.07%)	1(2.5%)	
Rural area	46(20.54%)	5(12.5%)	
Total	224(100.0%)	40(100.0%)	

Table-IV: Comparison of vitamin D level by complexion, lifestyle and monthly family income of the respondents (n=264)

Characteristics		Frequency (%)	Mean + SD vit D level (nmol/L)	One- way ANOVA Test
Complexion	Fare	132(50.00)	54.46+28.24	F= 5.202 p=0.006
	Medium	106(40.15)	47.49+26.17	
	Dark	26(9.85)	42.59+16.79	
	Total	264(100.00)	50.01+ 29.93	
Lifestyle	Military	50(18.94)	56.47+ 33.11	F= 2.866 p=0.059
	Civil	158(59.85)	46.90+25.77	
	Military spouse	56(21.21)	52.95+22.79	
	Total	264(100.00)	50.01+29.93	
Monthly family income (Taka)	5001-30000	44(16.66)	46.32+26.29	F= 2.184 p=0.023
	30001-60000	68(25.76)	46.61+26.59	
	60001-90000	77(29.17)	55.07+34.19	
	90001 -150000	75(28.41)	52.47+23.84	
	Total	264(100.00)	50.01+29.93	

Discussion

The study revealed the mean±SD level of vitamin D was 50.01+28.62 nmol/L. The prevalence of Hypovitaminosis D was 84.84%. In 2015, a study was conducted among the female garments workers in Dhamrai under Dhaka district. In that study, the prevalence of Hypovitaminosis D was found 100% among the lower socioeconomic group and it was 80% among the average socioeconomic group[14]. Another cross-sectional study conducted by a team of NSU, Dhaka found 88.16% among the children of 1-6 years of old[15]. International Osteoporosis Foundation in 2009 about high prevalence of Hypovitaminosis D across the different parts of Asia. It was 47% in Thailand, 49% in Malaysia, 90% in Japan and 90% in South Korea8. In a study in Argentina among the healthy elderly people living at home and found theproportion of hypovitaminosis D was 87%16. So, it is clear that findings of present study are well-matched with prevalence of previous study conducted home and abroad.

Among the male, the mean Vitamin D level was 50.86+26.93 nmol/L and among female had 49.60+26.19 nmol/L. In a study in India (Tirupati) the mean Serum 25(OH)D was 46.3 nmol/L among male and 38.7 nmol/L among the female[17]. A cross-sectional study in Vietnam showed the difference between vitamin D level between male and female respondents. There mean 25(OH)D level of male was 81.8 nmol/L and among the female it was 75.1 nmol/L[18]. Women have often many potential factors for having lower level of Vitamin D. Those are composition of body fat, less exposed to sunlight, less chance of physical activity, dietary constrain in country like Bangladesh. In comparison to other studies searched so far, in this study the margin of gender difference is minimum here. The study had a total 181 female respondents. Among those almost half (90 out 181) of them has already developed menopause. The mean Vitamin D level was a bit higher in the women of childbearing age (52.32+ 23.96 nmol/L) than that of post-menopausal women (48.03+ 13.07 nmol/L) (t, p<0.01). Another study found the strong relation of lower mean vitamin D level among the women of post-menopausal to from women of reproductive age. They observed about 5-8% decrease of mean vitamin D level with the increase of age by 10 years[19].

In this study, the mean value of vitamin D was higher among the respondents of upper socioeconomic status. The proportion of hypovitaminosis D was highest (97.8%) among the respondents who fall in the income group uptoTk 30,000 per month. But it was 76% among those who earn more than Tk 90,000 monthly. It was statistically significant. (p<0.05). The role of economic status was found controversial in previous studies. In another study in Bangladesh vitamin D deficiency of premenopausal women was measured among two socioeconomic group[20]. There was clear cut difference in vitamin D level between two groups. Among the women of lower socioeconomic group, the mean vitamin D level was 36.7 nmol/L, while it was 43.5 nmol/L among the women of higher socioeconomic group. This type of findings also revealed in a study conducted by team of scientist in Pakistan[21].

Conclusion

The prevalence of hypovitaminosis D was too high and sociodemographic determinants have a significant impact on vitamin D level. Effective measures need to be taken at all level to overcome nutritional disorder.The requirement of further study to explore the scenario among the national representative samples is earnestly realized.

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