A Health Survey On Vitamin D Among Saudi Female University Students

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Abstract— Objective: To assess the knowledge of female Saudi students on; the causes leading to vitamin D deficiency and the foods rich in vitamin. Methods: Female students of Princess Nourah Bint Abdul Rahman University, Riyadh, Kingdom of Saudi Arabia, were the study population. A descriptive cross-sectional study was done by adopting non-probability consecutive sampling technique. Sample size was 500. A closed-ended questionnaire was designed focusing on different causes of vitamin D deficiency and the food items rich in vitamin D. Data was analyzed by using SPSS version 20. Results: Normal range of vitamin D in the blood was known by just 32.6% of students. Right time for sun exposure to get adequate vitamin D was known by just 8.6% of students. Regarding the diet rich in vitamin D, for milk the response was 30% while for other items as fatty fish, egg yolk, beef liver, cod liver oil and cheese, the percentages were very negligible. Only 3.4% marked lack of proper sun exposure as a contributory factor for its deficiency, similarly just 17% knew that lack of fortified diet is one of the factors leading to vitamin D deficiency. Conclusion: The knowledge of Saudi university students on, the food rich in vitamin D and the role of sun exposure in the synthesis of this vitamin, is poor. Effective health education programs should be started at the earliest to control this major health issue.

Index Terms— bone pain, Causes, Deficiency, female, Sources, Saudi, Vitamin D.

1 INTRODUCTION

During the latest few years, the topic of vitamin D has become a highly significant subject in the medical world as vitamin D deficiency is recognized as a worldwide pandemic[1,2]. Normally vitamin D level in the blood should be more than 25 nanogram/milliliter. If the blood level ranges between 15-25 ng/mL, the condition is labelled as vitamin D insufficiency. Vitamin D deficiency is labelled when the level of it falls below 15ng/mL, this condition is associated with highly elevated serum levels of parathyroid hormone concentration; which increases the risk of bone fractures due to increase turnover of calcium from the bones [3]. Despite adequate sun light in the Kingdom of Saudi Arabia, vitamin D deficiency is a prevalent problem in adults mainly affecting females, two studies conducted in Saudi Arabia reported prevalence of 81% in female population, 4.[5] and the main reason was lack of awareness regarding adequate exposure to sunlight and the food rich in vitamin D [6,7]. For the last many decades, it was considered that vitamin D deficiency affects musculoskeletal system alone, as it could lead to Rickets among children and Osteomalacia in adults. But recent studies have proved that its deficiency affects other body organs and systems as well [1], as its deficiency could lead to numerous types of cancers[1,8,9], coronary heart disease[6], type 1 and 2 diabetes mellitus[11,12,13], hypertension[14], Alzheimer's[1,14] and mental disorders [14]. The worldwide deficiency of vitamin D in children and in adults [15] is multifactorial, such as intake of diet insufficient in vitamin D and calcium [16,18,19], inadequate exposure to UVB (ultraviolet B) sunlight[17], skin pigmentation [15]and overuse of sunblock creams [18]. Prolonged breastfeeding without vitamin D supplementation has also been identified as one of the causes of vitamin D deficiency[19,20,21,22]. Fortified food and sunlight are the two sources of Vitamin D. However, low dietary intake of calcium also ultimately results in low vitamin D level [19]. Ultraviolet B rays are the source of Vitamin D. At least twice in a week; face, arms, hands should be exposed to sunlight between 1 0 : 0 0 am and 3:00 pm, without the application of sunblock cream [1,3]. Those people having high skin melanin require a prolonged exposure time[1,3]. Keeping in view the high prevalence of vitamin D deficiency in the Kingdom despite the hot, sunny weather, this study was designed to assess the knowledge of the females on the different sources of vitamin D and the possible cause of its deficiency so proper recommendations could be formulated.

2 SUBJECTS AND METHODS

2.1 Setting

Different colleges of Princess Nourah Bint Abdul Rahman University were selected randomly, with the exception of the health science colleges e.g., medical college, dental college and nursing college.

2.2 Project Duration

From 1st of January 2015 till September 2015.

2.3 Study Subjects

Inclusion Criteria: Female students of different colleges aged between 18-22 years were enrolled.

2.4 Exclusion Criteria

Students of health science college were not included (such as those studying in medical, dental and nursing colleges), as their background medical knowledge could act as confounder.

2.5 Study Design

Cross-sectional descriptive study

2.6 Sample Size:

A sample size of 500 participants was selected. Previous literature showed prevalence of Vitamin D deficiency in Saudi around 81% (serum 25(OH) D < 25 ng/mL). We based our calculations on the latest prevalence of Vitamin D deficiency with CI of 95% and desired precision of ± 5%, so the minimum required sample size came out to be 500 participants.

2.7 Sampling Technique

A non-probability consecutive sampling technique was adopted.

Data Collection methods, instruments used, measurements: A closed-ended questionnaire containing 29 different Questions was distributed among the respondents. Demographic data included name of the college,

academic year, age, area of residence and average monthly income of the household. Specific questions pertaining to the knowledge on vitamin D, included the different food sources rich in vitamin D, time of exposure to sunlight and body parts, normal range of vitamin D in blood, different causes for vitamin D deficiency, signs and symptoms of its deficiency and personal information of the respondent on her vitamin D status.

Statistical analysis was done by using SPSS (Statistical Package for Social Sciences, Chicago, IL, USA) version 20. Descriptive and inferential analysis was done. For checking association between different qualitative data, Chi-Square test was applied keeping the level of significance $p \leq 0.05$.

3 Results

Table 1 shows the list of different colleges enrolled in this study. Twenty-five percentage of the contribution was from College of Preparatory Year followed by College of Computer Sciences and College of Business Administration (17% and16% respectively).

Table 2 shows Students of different academic years enrolled in study Most of the respondent belonged to 1st, 2nd and 3rd academic year (31%, 27% and 24% respectively).

Table 3 shows Different areas of residence of the respondents, most of the respondents belonged to Middle SA area of Riyadh (98.2%).

Table 4 shows Average Monthly Income of the household in Saudi Riyals (SR). Average monthly income of the household, of most of the respondents (49.2%) was between 10,000 -30,000 Saudi Riyals.

Table no.5 shows the knowledge of the respondents on the normal range of Vitamin D and the best time for exposure to sun. Most of the students (99.2%) have heard about Vitamin D from their family and friends (58%). Normal range of Vitamin D in the human body is between 20-50 ng/mL, as answered by 32.6%. Before 10 am is the best time for exposure to sun as answered by 79% of students. Only 8.6% of students knew that it is from 10 am till 3 pm.

Table 6 highlights the knowledge of the respondents on different issues of Vitamin D deficiency. Majority of them (80.4%) considered its deficiency as a major problem but a large proportion (41.6%) did not know the cause of it. Almost 23.2% considered it due to some genetic disorder while 17% considered that inadequate intake of diet rich in Vitamin D leads to Vitamin D deficiency. A very small percentage (3.4%) considered lack of exposure to sunlight as the cause. Forty percentage of the students labelled people with dark skin to be the risky group of developing Vitamin D deficiency while 20% considered overweight people to be at risk. Just 10% knew that children, pregnant and lactating mothers could be the risky group. Ninetthree percentage of the students knew that in its deficiency there is pain in joints and bones, 75% and 74% marked alopecia and delayed eruption of teeth as one the symptoms. For widening of the wrist joint and deformed knee joint among growing children, the yes responses were just 31% and 38% respectively. Just 61% knew that there is delayed standing among growing children as one of the symptoms.

Table 7 shows the personal information of the respondents regarding Vitamin D. It shows that most of the students (17% + 23% = 40%) exposed themselves to sunlight for just 30 minutes. Sixty percentage expose just their face and hands to sun. Sunblock cream of strength SPF. 15-30 was used by 29%. A large percentage of (57%) students were not tested for Vitamin D. Among those who were tested (215/500 or 43%), just 16% (35/215) had normal levels of vitamin D in their blood, while 43% (92/215) were insufficient and 41% (88/215) were deficient in Vitamin D.

Table 8, cross tabulation is done between different monthly family income families with the knowledge regarding on different food items rich in vitamin D. As the p value for all the mentioned food items came out to be more than 0.05, so means that there is no association of the socioeconomic status with the knowledge. All have the same level of knowledge whether right or wrong for the food items rich in vitamin D.

Table 9, cross tabulation is done between different monthly family income families with the different signs and symptoms mentioned. As the p value for all the mentioned signs and symptoms came out to be more than 0.05, so means that there is no association of the socioeconomic status with the knowledge on signs and symptoms of Vitamin D deficiency. All have the same level of knowledge whether right or wrong for signs and symptoms.

4 Discussion

The present study assessed the knowledge of Saudi students on different sources, symptomatology of Vitamin D deficiency and the personal information regarding their Vitamin D status. Most of the students have heard about Vitamin D from their family and friends, here in the Kingdom is active in displaying and distributing information on different health issues but maybe it has not focused on Vitamin D deficiency yet as it is a hidden /submerged portion of the iceberg, or the students did not focus on the health messages because of their academic engagements. Only 32.6% knew the correct normal range of Vitamin D in blood, those were the ones who were diagnosed as having insufficiency and deficiency of Vitamin D, as they became cautious of their vitamin D status. Surprisingly, the recommended time for sun exposure was known by just 8.6% of the respondents, this finding is similar with the results of international studies done Hong Kong [23] and Australia [24], where lack of awareness on proper timings for sun exposure was found. About 80-100% of vitamin D requirement is fulfilled by the exposure of skin to sunlight [25]. Lack of proper sun exposure is identified as the main cause of vitamin D deficiency; as proven by our study and many similar

international studies[25,26,27,28]. The life style in Saudi Arabia has also changed due to warm climate. For cosmetic reason also, there is increase use of sunblock creams and most of the time females stay indoor during the daytime, as revealed by many studies done in Saudi Arabia [29,30]. The preferred outing time in parks and malls for females, are usually after sunset. Our study also revealed that more than 50% of the girls use sunblock cream despite of covering their almost whole body health campaigns have promoted the use of sunscreen with high skin protection factor (SPF) to prevent against skin cancer[31,32], the use of sun protection products prevents UV-B rays from being absorbed by the skin, but their overuse results in vitamin D deficiency as well [35]. Regarding the correlation of vitamin D deficiency with wearing of veil, diverse finding was reported. The study done by Siddique and colleagues has shown that covering body while going outdoors, limits sun exposure and hence can cause vitamin deficiency [7,33]. Similar results were found in another study done in Arab-American women who wear veil[34]. But, surprisingly many other studies done in Saudi Arabia and in the west, reported that although veils minimize sun exposure but this is not a major contributory factor for vitamin D deficiency [35,36]. In West, comparative studies have reported that there is no difference in vitamin D blood levels between veiled and non-veiled women, furthermore it is reported that covering the face with the veil is not the real cause, Gannage-Yared et al, found that there were other factors that were responsible for low vitamin D levels than the veil itself

[37]. Women could expose their face, hand, arms and legs to sun while sitting in open places of home and limit the use of sunblock creams. In many international studies, it has been reported that just 15-30 minutes' exposure between 10 am to 3 pm, for at least twice in a week, is enough to have adequate levels of vitamin D in blood26,38,39. Respondents, knowledge regarding the food items rich in vitamin D and the symptoms

of vitamin D deficiency, is also very poor in our study, similar findings were revealed by other studies done in Saudi

Arabia[5,6,7]. In addition, the majority of the physicians working in the ministry of Health (MOH), in primary health care centers of Jeddah, Saudi Arabia, rated their nutritional knowledge as “poor” based on their responses in a validated questionnaire [40].

In other countries of the world, the picture is exactly the same, as shown by a study done by Khalsa in New York, many health care professionals were not fully aware of the benefits of vitamin D to public health [41]. In short, there is lack of nutritional knowledge in health care professionals from different countries rating from very poor to weak 42,43. Hence it is recommended that health awareness programs should be implemented by the ministry of health on media, in women’s parks, shopping malls, etc.; focusing on the diet rich in vitamin D and the proper timings and exposure of body, to sunlight. In Saudi Arabia, indoor lifestyle whether influenced by climate or culture, also acts as a factor, that needs modification. Women should be educated to visit the parks during the day time, take fortified food rich in vitamin D and do not overuse sunblock creams. Currently, bread and milk are fortified in Saudi Arabia [7], rice is a staple food in Saudi Arabia, so it needs to be fortified in addition. So in short, more active measures are needed to increase awareness to health care professionals and the general public about the importance of vitamin D for health, including the need for exposure to sunlight, adequate dietary intake of vitamin D and implementation of current recommendations to improve their vitamin D status. s of diagnosis. For example, individuals diagnosed in 1982 had the longest possible follow up time, while individuals diagnosed in 2011 had the shortest length of follow up.

6 Conclusion

It is concluded that main reason of vitamin D deficiency among Saudi females is lack of awareness on the food items rich in vitamin D, overuses of sunblock creams and improper exposure of body to sunlight.

7 Limitation of Study

There is unavoidable selection bias as males were not included, as the University is exclusively for females, secondly almost all the students had similar socioeconomic status. Thirdly, the target population was university students, which were not the real representative of Saudi female population. The error of selection bias might underestimate the magnitude of the problem in this population.

References

1. Holick M (2005) The vitamin D epidemic and its health consequences. J Nutr 35, 2739S–48S.
2. Masood S, Iqbal *M* (2008) Prevalence of vitamin D deficiency in South- Asia. Pak J Med Sci 24, 891–7.
3. Hollick MF. Vitamin D deficiency. What a pain it is?
4. Al-Daghri NM, Al-Attas OS, Al-Okail MS< alkharfy KM, Al-Yousef MA, Nadhrah HM, etal. Severe hypovitaminosis D is widespread and more common in nondiabetics than diabetics in Saudi Adults. Saudi Med J. 2010; 31:775-80. [PubMed]
5. Elsammak MY, Al-Wosaibi AA, Al-Howeish A, Alsaeed J. Vitamin D deficiency in Saudi Arabs. Horm Metab Res.2010; 42:364-8. Doi:10.1055/s-0030- 1248296. [PubMed]
6. Christie FT, Mason L. Knowledge, attitude and practice regarding Vitamin D deficiency among female students in Saudi Arabia: A qualitative exploration. Int J Rheum Dis. 2011;14: e22-9.doi:10.1111/j.1756-185X.2011.2011.01624x.[PubMed]
7. Siddique AM, Kamfar HZ. Prevalence of Vitamin D deficiency rickets in adolescent school girls in Western region, Saudi Arabia. Saudi Med J. 2007; 28:441- 4[PubMed]
8. Grant W (2005) An estimate of premature cancer mortality in the U.S due to Inadequate doses of solar Ultraviolet-B radiation. Cancer 94, 1867–75.
9. Lappe J, Travers-Gustafson D, Davies K, Recker R, Heaney R (2007) Vitamin D and calcium supplementation reduces cancer risk: results of a randomized trial. Am J Clin Nutr 85, 1586–91.
10. Vieth R, Kimball S (2006) Vitamin D in congestive heart failure. Am J Clin Nutr 83, 731–2.
11. Hyppo¨nen E, La¨a¨ra¨ E, Reunanen A, Jarvelin M, Virtanen S (2001) Intake of vitamin D and risk of type
12. Lee P, Chen R (2008) Vitamin D as an analgesic for patients with type 2 diabetes and neuropathic pain. Arch Intern Med 168, 771–2.
13. Pittas A, Lau J, Hu F, Dawson-Hughes B (2007) The role of vitamin D and calcium in Type 2 diabetes. A systematic review and meta-analysis. J Clin Endocrinol Metab 92, 2017–29.
14. Khalsa K (2009) The Vitamin D Revolution, How the Power of This Amazing Vitamin Can Change Your Life. Hay House Inc., New York.
15. Bischoff-Ferrari HA, Giovannucci E, Willett WC, Dietrich T, Dawson-Hughes B. Estimation of optimal serum concentration of 25-hydroxyvitamin D for multiple health outcomes. Am J Clin Nutr. 2006; 84:18-28. [PubMed]
16. Kamycheva E, Joakimsen RM, Jorde R. Intakes of calcium and vitamin D predict body mass index in the population of Northern Norway. J Nutr. 2003; 133:102-6 [PubMed]
17. Dawodu A, Agarwal M, Hossain M, Kochiyil J, Zayed R. Hypovitaminosis D and vitamin D deficiency in exclusively breast-feeding infants and their mothers in summer: a justification for vitamin D supplementation of breast-feeding infants. J Pediatr. 2003; 142:169-73.1067/mpd.2003.63. [PubMed] [Cross Ref]

18. Khalsa K (2009) The Vitamin D Revolution, How the Power of This Amazing Vitamin Can Change Your Life.
19. Fuleihan G (2009) Vitamin D deficiency in the Middle East and its health consequences for children and adults. Clinic Rev
20. Bahijri SM (2001) Serum 25-hydroxy cholecalciferol in infants and preschool children in the Western region of Saudi Arabia Etiological factors. Saudi Med J 22, 973–9.
21. Sadat-Ali M, AlElg A, Al-Turki H, Al-Mulhim F, Al- Ali A (2009) Vitamin D levels in healthy men in eastern Saudi Arabia. Ann Saudi Med 29, 378–82.
22. Dawodu A, Wagner C (2007) Mother-child vitamin D deficiency: an international perspective. Arch Dis Child 92, 737–40.
23. Kung AWC, Lee K. Knowledge of vitamin D and perceptions and attitudes towards sunlight among Chinese middle-aged and elderly women: a population survey in Hong Kong. Biomed Central Public Health.2006;6: 226.doi:10.1186/1471-2458-6-226. [PMC free article] [PubMed]] Cross Ref]
24. Janda M, Youl P, Bolz K, Niland C, Kimlin M. Knowledge about health benefits of vitamin D in Queensland Australia, Prev Med. 2010;50:215- 6.doi: 10.1016/j.ypmed.2010.02.004. [PubMed] [cross Ref]
25. Glerup H, Mikkelsen K, poulsen L, Hass E, Overbeck S, Thomsen J, et al. Commonly recommended daily intake of vitamin D is not sufficient if sunlight exposure is limited. J Itern Med.2000;247: 2608.doi:10.1046/j.1365 2796.2000.00595.x. [PubMed] [Cross Ref]
26. Horlick M. Vitamin D deficiency. N Eng J Med. 2007; 357:266 81, doi:10.1056/NEJMra070553. [PubMed]
27. Holick M. (2007) Vitamin D and skin physiology; a D- Lighted story. J Bone Miner Res 22,28-33.
28. Webb A, Kline L, Holick M (1988) Influence of Season and latitude on the cutaneous synthesis of vitamin D3: exposure to winter sunlight in Boston and Edmonton will not promote vitamin D3 synthesis in human skin. J Clin Endocrinol Metab 67, 373-8.
29. Holick M. The vitamin D epidemic and its health consequences. J Nutr. 2005; 35:2739S-48. [PubMed]
30. Kensarah OA, Azzeh FS. Vitamin D status of healthy school children from western Saudi Arabia. Pak J Nutr.2012;3:288.
31. Glerup H, Mikkelsen K, Poulsen K, et al. (2000) Commonly recommended daily intake of vitamin D is not sufficient if sunlight exposure is limited. J Intern Med 247, 260-8.
32. Holick M (2001) Sunlight “D” ilemma: risk of cancer or bone disease and muscle weakness. Lancet 357,4-6.
33. Al Faraj S, Al Mutairi K. Vitamin D deficiency and chronic low back pain in Saudi Arabia. Spine.2003;28: 177-9.doi:10.1097/00007632- 200301150-00015. [PubMed] [Cross Ref]
34. Hobbs RD, Habib Z Alromainhi D, Idi L, Parikh N, Blocki F, et al. Severe vitamin D deficiency in Arab- American women living in Deborn. Mich Endocr Pract.2009;15: 35-40.doi:10.4158/EP.15.1.35. [PubMed] [Cross Ref]
35. Sedrani SH, Elidrissy AW, El Arabi KM. Sunlight and vitamin D status in normal Saudi subjects. Am J Clin Nutr.
36. Islam MZ, Akhtaruzzaman M. Hypovitaminosis D is common in both veild and nonveild Bangladeshi women. Asia Pac Clin Nut. 2006; 15:817. [PubMed]
37. Gannage-Yared MH, Chemali R, Yaacoub N, Halaby G. Hypovitaminosis D in a sunny country: relation to lifestyle and bone markers. J Bone Miner Res 2000;15:1856-1862.
38. Nagpal S, Na S, Rathnachalam R. Noncalcemic actions of vitamin D receptor ligands. Endocr Rev 2005; 26: 662-87.
39. Holick ME. The vitamin D epidemic and its health consequences. J Nutr 2005; 135:2739S-2748S.
40. Al-Zahrani AM, Al-Raddadi RM. Nutritional knowledge of primary health care physicians in Jeddah, Saudi Arabia. Saudi Med J. 2009; 30:284-7. [PubMed]
41. KhalsaK.The vitamin D revolution, how the power of this amazing vitamin Can change your life. New York: Hay House Inc.; 2009.
42. Heywood P, wootten SA. Nutritional knowledge and attitudes towards nutrition education in medical students at Southampton University Medical School. Proc Nutr Soc. 1992; 51:67A.
43. Temple NJ. Survey of nutritional knowledge of Canadian physicians. J Am Coll Nutr.1999;18:26-9.doi:10.1080/07315724.1999.10718823. [PubMed] [Cross Ref]

Table 1 List of different colleges enrolled in study

Name of Colleges	N=500	Percentage
College of Community	74	15
College of Business Administration	81	16
College of Arts and Design	10	2
College of Education	45	9
College of Preparatory Year	124	25
College of Computer Sciences	87	17
College of Arts	22	4
College of Foreign Languages	44	9
College of Kindergarten	13	3

Table 2 Students of different academic years enrolled in study

Year in College	N=500	Percentage
First	153	31
Second	136	27
Third	122	24
Fourth	73	14.8
Fifth	15	3
Sixth	00	0
Seventh	01	0.2

Table 3 Different areas of residence of the respondents

Area	N=500	Percentage
North SA	2	0.4
East SA	2	0.4
South SA	5	1
Middle SA	491	98.2

Table 4 Average Monthly Income of the household in Saudi Riyals (SR)

Monthly Income (SR)	N=500	Percentage
< 10,000	145	29
10,000-30,000	246	49.2
30,000-50,000	83	16.6
> 50,000	26	5.2

Table 5 Knowledge on Vitamin D of the respondent

Variable	N=500	Percentage
Have you heard about Vitamin D?		
Yes	496	99.2
No	004	00.8
Source of information on Vitamin D		
Family & friends	291	58
University	016	3
Health Magazines	094	19
Media	095	19.2
Not heard before (Not applicable)	004	0.8
Normal range of Vitamin D in human body (ng/mL)		
< 12	056	11
< 20	244	49
20 - 50	163	32.6
> 50	037	7.4
Best time for exposure to sun light		
Before 10 am	395	79
From 10 am to 12 pm	50	10
From 10 am to 3 pm	43	8.6

Figure 1 Knowledge of the respondents for different food sources rich in Vitamin D

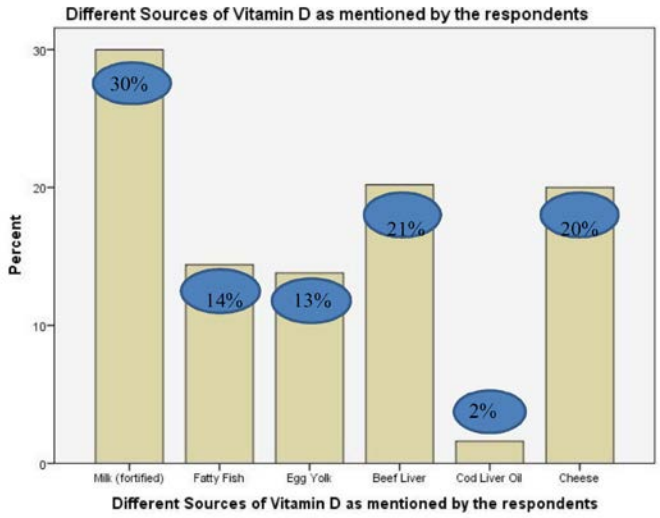

Table 6 Knowledge on Vitamin D deficiency

Variable	N=500	Percentage
Condition of Vitamin D deficiency		
Major health problem	402	80.4
Minor health problem	046	9.2
Not a health problem	012	2.4
	040	8
Causes of Vitamin D deficiency		
Lack of exposure to sunlight Wearing Hijab	17	3.4 8.4
Genetic disorder	42	23.2
Inadequate intake of diet rich in Vitamin D	116	17
Respiratory Infections	85 32	6.4
Do not know	208	41.6
People at risk		
Children	50	10
Teenagers	42	8.4
Old people	48	9.6
Males	05	1
Females	05	1
Pregnant & breast feeding mother	50	10
Symptoms of Vitamin D Deficiency (respondents had the choice to mark more than one option)		
Pain in joints and bones	467	93
Alopecia	375	75
Depression	290	58
Widened wrist joint	154	31
Delayed eruption of teeth	372	74
Delayed standing in children	303	61
Deformed knee joint among children	192	38

Table 7 Personal information regarding Vitamin D

Variable	N=500	Percentage
Exposure time to outdoor/sun		
Less than 15 minutes	84	17
15minutes to 30 minutes	117	23
1 hour to 3 hours	225	45
4 hours to 7 hours	60	12
8 hours to 10 hours	14	3
Body parts exposed to sun		
Face and hands	333	67
Face, hands and arms	117	23
Face, hands, arms and legs	50	10
Strength of sunblock cream that you apply		
Below SPF 15	81	16
Between SPF 15-30	145	29
Between SPF 30-50	50	10
SPF+50	15	3
Do not apply	209	42
Have you ever had your Vitamin D test		
Yes	215	43
No	285	57
Result of your test (among those who were tested, n=215)		
Normal	35	16
Insufficiency	92	43
Deficiency	88	41

Table 8 Association of different monthly family income with the knowledge of food sources of Vitamin D (application of Chi-Square Test keeping the level of significance at ≤ 0.05)

Food Items	Monthly Family Income (SR)	p-value
Fortified Milk	< 10,000 to < 50,000	0.58
Fatty Fish		0.99
Egg Yolk		0.44
Beef Liver		0.42
Cheese		0.55
Cod Liver Oil		0.08

Table 9 Association of different monthly family income with the different signs/symptoms of Vitamin D deficiency (Application of Chi-Square Test keeping the level of significance at ≤ 0.05)

Signs/Symptoms	Monthly Family Income (SR)	p-value
Bones and joints pain	< 10,000 to < 50,000	0.67
Alopecia		0.42
Depression		0.38
Broadening of wrist joint		0.07
Delayed eruption of teeth		0.54
Delayed standing		0.43