

Dietary vitamin D Intake among Students at the University of Hail, Saudi Arabia

Asra Anjum¹, Dr. Suzan Amin²

^{1,2}(Public Health Department and Biology Department, Preparatory year, University of Hail , Saudi Arabia)

Name of the Candidates: Awatif Sultan, Wejdan Bashir, Bouthinah Ahmed Mohammed Alateeq, Rawan Mohammad, Reem, Rwabi & Tahany .

Abstract: *Vitamin D is important for the maintenance of healthy bones, and its deficiency causes rickets in children and osteomalacia in adults. Lower levels of vitamin D in the blood are also a risk factor for osteoporosis, impaired muscle function and an increased risk of falls and fractures. The study was conducted to assess levels of dietary vitamin D among students at the University of Hail, Saudi Arabia. A cross sectional study of 100 Saudi females ages between 18 -21 were randomly selected at the university of Hail. They were assessed using a food frequency questionnaire. Student knowledge about the benefits of Vitamin D was also assessed using survey questions. Our results indicate that student knowledge on Vitamin D and its benefits are known by the students. However dietary Levels of vitamin D are lacking in the students. Workshops for health education and prevention should be encouraged to help solve this issue.*

Keywords: Vitamin D; causes; sources; deficiency and Hail Saudi Arabia

1. Introduction

Vitamin D plays an important role in bone health and neuromuscular function.¹ The main source of Vitamin D in the body is by synthesis from exposure to the sun's UVB rays.² Another source is through the diet, in particular foods such as seafood, shrimp, mushroom, egg Yolk and fortified milk.³

Vitamin D deficiency is recognized as a pandemic. The major causes of vitamin D deficiency include: lack of sun exposure. The next major cause of lack of vitamin D is by diet as very few foods naturally contain vitamin D, and foods that are fortified with vitamin D are often inadequate to satisfy either a child's or an adult's daily vitamin D requirement.

Other reasons for a deficiency in Vitamin D include when your kidneys cannot convert vitamin D to its active form and also when your digestive tract cannot absorb Vitamin D. Obesity has also been shown to be related to vitamin D deficiency.³

Vitamin D deficiency causes rickets in children and will precipitate and exacerbate osteopenia osteoporosis, and fractures in adults.⁴ Vitamin D deficiency has been associated with increased risk of common cancers, autoimmune diseases, hypertension, and infectious diseases.⁵

Despite a year-long abundant sunlight in several countries in the Middle East and Asia, vitamin D deficiency is very common among different populations present in these countries. It has been reported in Morocco, Jordan, and Saudi Arabia, Lebanon, China, and Thailand as well as the Indian subcontinent region.¹

To our knowledge, there is a lack of studies addressing vitamin D status among young Saudi females in the Hail Region of Saudi Arabia. A study from 2007, looking at the

vitamin D status among Saudi females visiting a health clinic in Riyadh found a high prevalence of Vitamin D deficiency and this was related to dietary intake and a lack of exposure to sunlight.⁶

2. Aims

- Assess the levels of vitamin D levels among the students through diet
- Assess the dietary patterns of the students in our study.
- Assessment of fast food intake as obesity has been shown to be connected with Vitamin D deficiency
- Assess participant knowledge of the beneficial effects of vitamin D.

3. Material and Methods

Subjects: In this cross-sectional study, a total of 100 (female students) apparently healthy Saudi volunteers, aged 18-21 years were recruited from the University of Hail, Hail, and KSA using a randomized sampling technique. Written informed consent was obtained prior to the study. Ethical approval was granted by the College of Science's Ethics Committee, University of Hail, Hail, and Saudi Arabia.

Samples Collection

A structured questionnaire was used to collect information from subjects on age, family history, medical history, and usual dietary habits.

Assessment of Dietary Intake

Dietary intake was assessed using a food frequency questionnaire.⁷ To ensure validity, reliability and reproducibility, a face-to-face standard interview was conducted with the subjects instead of the conventional self-administered questionnaire.

Statistical Analysis

Data were analyzed using Excel including simple descriptive statistics, t-tests, correlations, 1 or 2-way analysis of variance, regression Independent Student test were employed to compare means of normally distributed data.

4. Results

Our first set of results looked at knowledge of Vitamin D and its uses among the students. The survey was conducted among the students of ages between the ages of 18 to 21. According to our results 96.2% of the students are aware of the disease called osteoporosis. 82.1% students are aware that vitamin D in their diet could be protective against osteoporosis and 62.3% students are aware of the foods that contain vitamin D. 70.2% are aware of the disease called rickets in children and osteomalacia in adults due to vitamin D deficiency. 80.4% of the students are aware of vitamin D synthesis in the skin on exposure to sunlight. Only 45.2% students are aware of the importance of vitamin D in the calcium absorption in the intestine and 54.7% of the students are unaware of its use in calcium absorption in the

intestine. 79.7% students have never experienced any vitamin D deficient diseases (Figure 1)

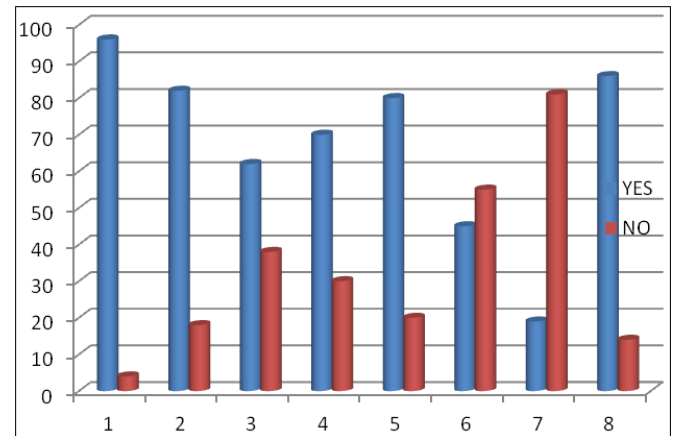


Figure 1: Student responses to questions on knowledge of vitamin D and its uses. The X axis refers to question number and the Y axis refers to frequency of yes and no responses.

Table 2: Fast food habits of the students. Values are given as percentages of actual total. (* denotes significant P value $p < 0.05$).

9	Daily	once a week	twice a week	three times a week		
	27%	54%	5%	13%		
10	Homemade	restaurant				
	84%	16%				
11	traditional	fast food				
	15%	85%*				
12	pizza	shawarma	hamburger	fried chicken	french fries	all of the above
	20%	10%	14%		4%	52%*

Our second set of results looks at the fast food habits of the students. According to the fast food habits of the students

85% of the students eat outside the home and 52% of the students eat all the types of fast foods surveyed (Table 2).

Table 3: Dietary habits of the students values given are percentages of total,

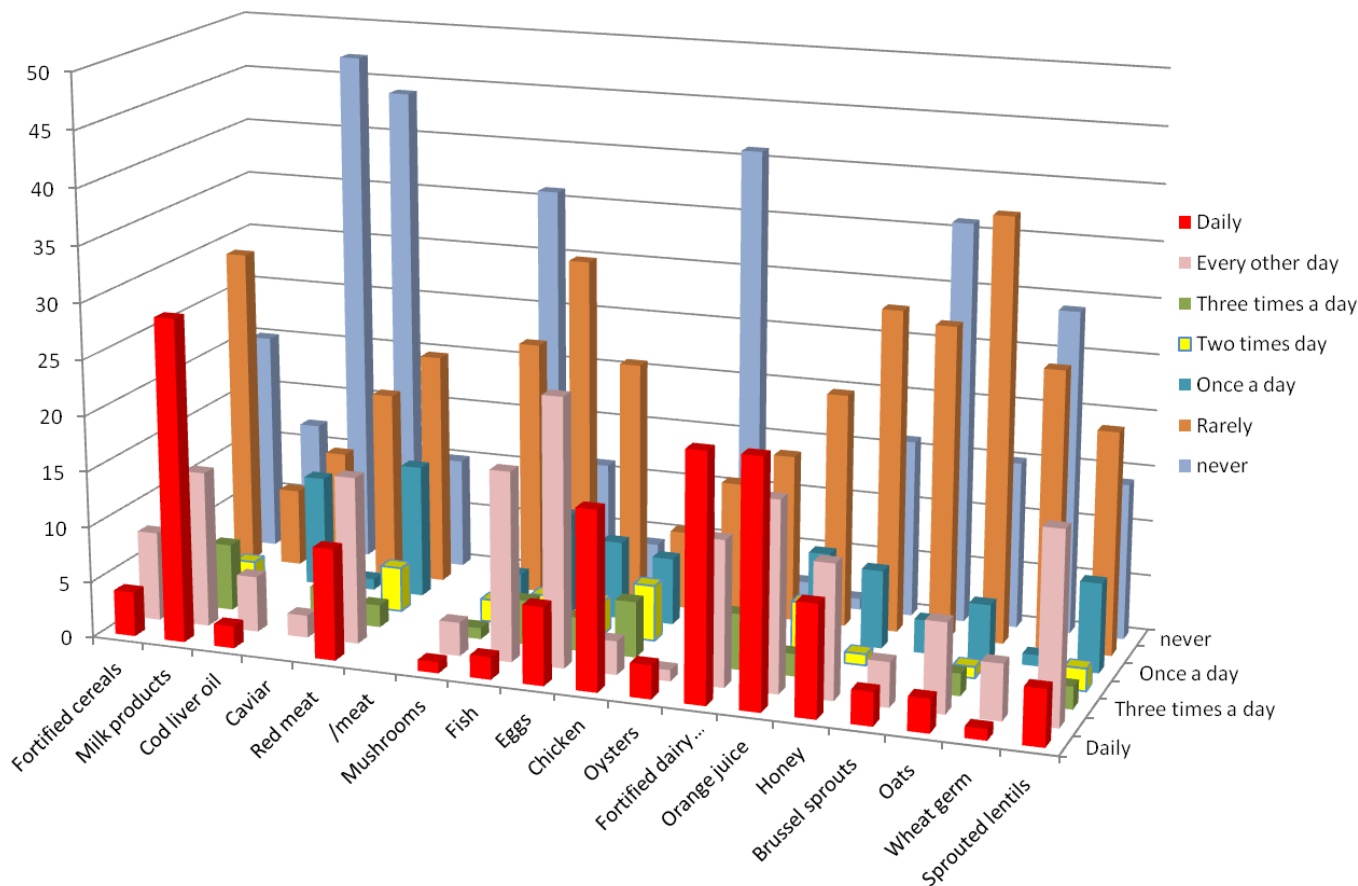
Type and Frequency	Daily	Every other day	Three times a day	Two times a day	Once a day	Rarely	never
Fortified cereals	4	8	1		1	29	20
Milk products	29	14	6	3		7	12
Cod liver oil	2	5			10	11	47
Caviar		2	3		1	17	44
Red meat /meat	10	15	2	4	12	21	10
Mushrooms	1	3	1	2	3	23	36
Fish	2	17	4	3	9	31	11
Eggs	7	24	3	3	7	22	4
Chicken	16	3	5	5	6	7	7
Oysters	3	1			1	12	41
Fortified dairy products	22	13	5	2	9	15	2
Orange juice	22	17	2	5	8	21	1
Honey	10	12		1	7	29	16
Brussel sprouts	3	4			3	28	36
Oats	3	8	2	1	5	38	15
Wheat germ	1	5			1	25	29
Sprouted lentils	5	17	2	2	8	20	14

The third set of results looks at the dietary intake of Vitamin D among the students.

Table 3 shows the dietary intake of certain foods rich in Vitamin D among the students at the University of Hail. It is worth noting that a quarter of the females surveyed here had milk products on a daily basis (29%). Orange juice and

fortified milk products were the next most popular food on a daily basis among the students showing percentages of 22% respectively. Every other day eggs were most popular food eaten with value of 22%. Foods rarely eaten by the students include fortified cereals, fish, honey and oats with

percentages of 29 %, 29% and 38% respectively. Foods never eaten by the students include cod liver oil, caviar, mushrooms and oysters with values of 47%, 44.9%, 36% and 41% respectively.



5. Discussion

Vitamin D plays an important role in diverse physiological functions in addition to its role in bone homeostasis.

In our study dietary intake of vitamin D was lacking especially as up to 41% of the students never consumed fish products. Fish is a rich source of Vitamin D.⁴

Hail is a mountainous region and is remotely located from the seacoast compared to the Eastern and Western regions of the Kingdom, which may drive the population dietary habits to depend mainly on cattle and poultry meat rather than sea food, hence the low intake of this.

Our study coincides with other studies that also report vitamin D deficiency. A recent study demonstrated that more than 90% of non-white and about 75% of white population groups in the United States now suffer from vitamin D insufficiency.⁸ Despite the plentiful sunshine in the Middle East and Asia, some countries in these regions report the highest rate worldwide of hypovitaminosis D. One study from Qatar, reported vitamin D deficiency in 97% of all health care professionals (mean level of 25(OH) D<75 nmol /L).⁹ One study in Jeddah Saudi Arabia, of 1,172 randomly selected healthy Saudi women, 80% of them showed vitamin D deficiency.¹⁰ However, another study that was conducted in the Eastern region of Saudi Arabia

reported a lower prevalence of 30% vitamin D deficiency among young females aged 25 to 35 years.¹¹

Even though Saudi Arabia has a sunny climate, many of the females cover up when outside so may not get as much sun exposure as liked to help in the cutaneous synthesis of vitamin D. The nature of clothing is important, for example, black wool worn in Saudi Arabia and other Middle Eastern countries is twice as effective in absorbing and thus preventing transmission of incident UV-B radiation to the skin for the synthesis of Vitamin D as compared to white cotton.¹² During the main sunlight hours between 12 and 3pm, females would not be exposed to the sun due to the high heat and humidity.

Our results also indicate that fast food intake was high among our students surveyed. Our value of 52% is much higher than the value for fast food consumption reported in Abha among young adults¹³ but in accordance with a study in Riyadh.¹⁴

The increased intake of fast food in our study equates with high levels of fat, free sugars, sodium, and cholesterol.^{15, 16}

This in turn can lead to obesity and the bioavailability of vitamin D, being a fat soluble vitamin is actually decreased in these individuals. Which may result in the deficiencies of this vitamin observed in these individuals.¹⁷ This may in turn

lead to an inverse relationship between fat intake and vitamin D status.

There could be a genetic and ethnic predisposition to vitamin D deficiency as one study found Saudis and Yemenis were more subjected to 25(OH) D deficiency in comparison to Egyptians and other nationalities ($P=0.01$).¹⁸ More studies however on a larger scales with more regions of Saudi Arabia could answer this.

6. Implications for Research

We recognize some limitations to our study although the sample size was appropriate, it was relatively small, and it was not population based. Therefore, the findings might not reflect the actual prevalence of vitamin D deficiency in the general population as a whole, but it could be significant. We collected the survey answers only once during the month of November, dietary habits in the summer months can change so in future studies it would be useful to evaluate our students at different times of the year to correlate with seasonal changes in vitamin D.

7. Conclusions

Students in this study had knowledge of Vitamin D deficiency and how to obtain it from their diet. Students in this study were deficient in Vitamin D and this is related to diet.

More studies however are needed to assess the actual amounts of vitamin D in the students and to compare this with BMI.

8. Acknowledgement

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