Knowledge, Attitudes, Behavior and their impact on Vitamin D Status among Undergraduate University Female Students

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ABSTRACT

The research was carried out to study the effect of some personal, behavioral, and environmental factors on vitamin D level amonguniversity female undergraduates in Egypt.A convenient sample consisted of125 first grade Egyptianuniversity female youth was selected. Written consentswerean initial basic step. They filled aknowledge, attitudes, and practice (KAP) pre-structured questionnaire and were subjected to dietary assessmentusing 24 hours recall, frequencypattern, and milk consumption sheets. Laboratory evaluation of vitamin D and related indicators were measured. Food intake was analyzed and compared to the recommended dietary allowances using the food composition table of the National Nutrition Institute and based on WHO/FAO recommendations. Resultsrevealed that majority of respondents (96.0%) were veiled and 88.0 % were exposed to sun at noon time. Face and hands were the exposed parts in 96.0% of responses and 56.0 % mentioned that sun- exposure took more than an hour. Exposure to pesticides was mentioned in 16.0% of responses. Nearly two thirds were exposed to sun while windows were closed. Only 22.0% heard about vitamin D and two thirds considered milk among un-favored food items. This study concluded that to track progress toward getting rid of a health problem, we have to raise the level of awareness of youth and young adults about this problem.This study emphasized the need for further vitamin D assessment and interventions targeted at all people. There is an urgent need for public education about the vital role of vitamin D to improve vitamin D- related practice and to minimize the complications of its deficiency.

Key words: *Vitamin D awareness-Female Adolescent -University undergraduate.*

INTRODUCTION:

The general physiological function of vitamin D (VD) is to keep us healthy by promoting strong bones, properly functioning muscles and a potent immune system. When weather and season allows, we can keep our vitamin D levels up through the endogenous production during carefully dosed exposure to sunlight**(Carlberg 2014).**UVB rays are present only during mid-day at higher latitudes and do not penetrate clouds. The time needed to produce adequate vitamin D from the skin depends on the strength of the UVB rays (i.e., place of residence), the length of time spent in the sun, and the amount of pigment in the skin(**Kulie, et al., 2009).**

Sunlight is strong throughout year in Egypt which should be sufficient for skin to manufacture the vitamin. However, many females of the population are veiled, commonly covering their whole body except the face, hands, and feet; therefore, many females may not be exposed to sufficient amounts of sunlight (**Botros, 2015).** In addition**,** the level of air pollution is negatively associated to the amount of solar UVB that reaches earth surface, as a result, more pollutant areas, less UVB passage and consequently, 25 (OH) vitamin D cutaneous syntheses reduces **(Hossein-panah, et al., 2010).**

SUBJECTS & METHODS

The research was carried out to study the effect of some personal, behavioral, and environmental factors on vitamin D level among Egyptian university female undergraduates.

Subjects:

A convenient sample was selected covering 3 seasons; autumn, winter, and spring, and consisted of 125 apparently healthy Egyptian first grade university female youth. A written consent was an initial basic step. They were subjected to:

Methods:

A KAP (Knowledge, attitudes, and practice) pre-structured questionnaire was designed to assess vitamin D-related knowledge, dietary attitudes, and actual vitamin D–related practice among 125 undergraduate female adolescents. They were conveniently selected among those attending Helwan University.

Laboratory indicators

Laboratory analysis were measured using (Stanbio Total Calcium Liquicolor, Procedure No 0150) for calcium (Ca) **(Sarkar and Chauhan, 1967),** (Bio Med – phosphorous (PH123100)) for phosphorus (P) **(Vassault, 1989),** and **(**DRG-DEA) Kinetic method for alkaline phosphates (ALP) **(Tiets, (1995).** All previous tests were done using spectrometric device (Kenza, France). Serum 25-OH vitamin D was done by DRG ELISA **(Houghton and Vieth, 2006)** LOT: 80k035 Cat .Nr:EIA5396` and Serum Parathyroid hormone (PTH) was done by immune-enzymatic assay (HPTH-ASIA) Cat NO.: kAP1481 **(Martin, 1979).** Blood samples were delivered to the National Nutrition Institute (NNI) labs for testing.

Dietary assessment

Dietary assessmentwas done using 24 hours dietary recall, frequency pattern, and milk consumption sheets.Food intake was compared to the recommended dietary allowances using the food composition table of the National Nutrition Institute and based on WHO/FAO recommendations **(NNI, 2006) (FAO/WHO/NUN, 2004).**

RESULTS:

Table (1) showed that 74.0% of female college had low vitamin D levels; either in the deficient or in the insufficient range. Serum PTH was high in 22.0% and low serum calcium was present in 45.0%. Serum alkaline phosphatase was in the normal range and 47.5% had high serum phosphorus level. However fasting was optional

and blood samples were collected at different times in relation tolast eaten meal.

Based on Cut-offs of VD, PTH, and Calcium Simultaneously (vitamin D metabolic status); 11 (26.0%) of participants; in the spring sample, were considered deficient/or insufficient in their VD and 15 (36.0%) were considered as having normal levels (sufficient). As for the autumn sample, 8 (14.0%) were deficient/ or insufficient and 42 (71.0%) had normal VD values.

Vitamin D-related knowledge and actual practice:

One of the principal indicators for tracking progress toward getting rid of a health problem is the extent to which youth and young adults have comprehensive correct knowledge of that problem. Exploring vitamin D related practices showed that:

Majority of respondents 89.0 % were exposed to sun and did that at the optimum time (around 12 o'clock). Face and hands were the parts exposed in 96.0% of responses and 59.0 % mentioned that the exposure took more than an hour. Exposure to pesticides was mentioned in 20.0% of response. Nearly two third of adolescent females were exposed to sun at their homes while windows were closed.

Table (4) showed frequency distribution of participants by some vitamin D-related knowledge. The level of awareness about vitamin D was low as only 27 university graduates out of 125 (22.0%) had some previous knowledge about vitamin D. Among respondents who had heard about vitamin D (27 students), 24 related the importance of vitamin D for bone health, 18 knew that sun-exposure had a relation to vitamin D and mentioned sun-rays as being the best source for the vitamin ever. Only 7 respondents thought that daily food intake was sufficient enough to give our needs from vitamin D but nearly none was knowledgeable about vitamin D content in various milk forms.

Majority thought that vitamin D is prevalent among girls but only 18 were able to give an explanation. Following the nutrition education session, participant females were able to give correct responses.

Vitamin D-related Dietary practices:

Nearly all student females (90.0 %), consumed milk just once per day and two thirds considered milk among the un-preferred food items and anotherone third considered milk a costly food item.

Based on WHO recommendations **(2006)**, the analysis of previous 24 hours before interview reflected the marked shortage in daily energy intake among respondents as reflected by the median value for energy consumption regardless of number of calcium services. Three quarters of student females were receiving below the recommendation of 2200 kcal daily.

Only half of participants who received 3 servings of calcium had their energy recommendations fulfilled. In contrast, protein intake was nearly 127.0% of recommendation on average and a source of 12.8 % of total energy per day. Consumption of calcium rich products with every meal ensures that requirements are met for calcium and phosphorus, and other minerals needed for bone health**(Peters, et al., 2012)**

In contrast to the accepted average intake of phosphorus, average calcium in diet was significantly less than daily recommendation of 1300 mg daily **(FAO/WHO,2004)**even among the group who consumed 3 calcium services. Calcium to phosphorus ratio in diet was almost reversed and this was related to increased consumption of high-phosphorus containing food items as legumes, processed cheese as well as soft drinks.Magnesium in diet was also less than WHO/FAO recommendations of 230 mg per day.

The average dietary

intakes of iron was inadequate if compared to WHO/FAO recommendations of 29-31 mg and 25.0% of respondents had zinc intake below the recommendation of 8 mg per day provided that diet composition was of moderate bioavailability for both of them.
Table (7) showed Spearman nonparametric - correlation between Vitamin D status groups and some risky Factors: a very significant correlation between vitamin D metabolic state and season of the year. Vitamin D sufficient level is more likely to be achieved in autumn more than in spring and this could be explained by more exposure to sun in autumn compared to spring where hot weather in spring could limit sun exposure.

Results showed also an important trend between frequency of fish consumption and vitamin D state. The more the consumption of fish, the more likely is the achievement of normal vitamin D state. On the other hand, frequency of consumption of calcium food sources did not show any significant correlation with vitamin D state. This study showed that the main predictor of low vitamin D status was seasons of the year.

DISCUSSION:

This study raised a health concern for the Egyptian population in general. If healthy adolescents, living in a country with abundant sunshine, specializing different fields including the pharmacy college have this lack of knowledge about vitamin D deficiency, what can we say about the situation among the Egyptian community overall? One of the principal indicators for tracking progress toward getting rid of a health problem is the extent to which youth and young adults have comprehensive correct knowledge of that problem. University students and particularly Pharmacists have the capacity to use their unique perspective concerning drug therapy and collaborate in a multidisciplinary approach to monitor and optimize vitamin D

supplementation in all patients, especially those who are at high risk.

Concerning vitamin D related practice; determinants that influence the synthesis of 25 (OH) vitamin D in the skin as exposure to UVB solar radiation, the strength of the UVB rays (place of residence), the length of time spent in the sun, skin hue, sun-screen use, and being indoors**(Tsiaras and Weinstock, 2011) (Report of the Independent Advisory Group on Non-ionising Radiation, 2017)**did not show their effects on vitamin D level among college females as 96.0% were veiled and two-thirds had dark skin-hue and may not be exposed to sufficient amounts of sunlight. Results also showed that nearly two thirds of participated females were exposed to sun while windows were closed and it is evidenced that UVBrays do not penetrate clouds or closed windows**[2].** Other factors were nearly equivocal in University Hostel-situation. The only variation in serum vitamin D showed in this study was due to season of the year.

Natural dietary sources of 25(OH vitamin D are very few and foods that are fortified with 25 (OH) vitamin D are often inadequate to satisfy either a child's or an adult's 25 (OH) vitamin D requirement**(Calvo, et al., 2005).** On the other hand, adolescence is critical ages to skeletal growth and reach to optimal peak bone mass. The enough intake of calcium and 25(OH) D_3 from the diet, and the achievement of normal serum range of calcium and 25(OH) D_3; have positive effects on bone in adolescents. Milk consumption positively correlates with bone mineral density of the total body, spine and radius in adolescent girls **(Peters, et al., 2012).** Unfortunately, nearly all college females (90.0 %), consumed milk just once per day. Two thirds mentioned milk among the un-preferred food items and another one third considered milk a costly food item.

Although, non-

parametric correlation between vitamin D metabolic status and frequency of food items' intake was not statistically significant, yet it showed a positive trend between frequent fish consumption and VD status.

In theory, consuming calcium-rich foods such as bones, fermented dairy (e.g., unsweetened yogurt, kefir, and cheese), leafy greens, almonds, and chia seeds may be an effective strategy for improving both calcium intake and long-term health.

Apart from milk fortification; vitamin D fortification is still not used to reach the needed levels for vitamin D intake in Egypt. Considering the above-mentioned results that two thirds of college females mentioned milk among the un-preferred food items and another one third considered milk a costly food item, so, it is needed to increase vitamin D fortification of staples, such as grain products, include pasta, bread, and other baked goods that are frequently consumed by the general population and could be the greatest source of vitamin D for all age, gender, and racial groups,

Dietary supplement use is another option for improving vitamin D status. Dietary supplements are allowed to contain up to the tolerable upper limit (2000 IU or 50mg) as designated by the 1997 Dietary Reference Intakes**(Calvo, et al., 2005)**. The introduction of more a novel dietary supplement product as fruit drinks or chocolate candy can lower the barrier to obtaining adequate vitamin D intake for many individuals and suggests a new approach to providing products that are custom designed to the tastes and needs of a specific target population.

CONCLUSION

In conclusion the cost to fortify food with vitamin D or to increase supplement potency is relatively inexpensive compared with the cost of developing drug treatments for the many chronic

diseases strongly associated with vitamin D insufficiency. In the case of maintaining optimal vitamin D status, an ounce of prevention may very well be worth a pound of cure.

RECOMMENDATIONS

There is an urge need to increase the awareness among people about the importance of sun exposure as the main source of vitamin D and about the healthy diet rich in vitamin D. Dietary fortification of a staple food with calcium and vitamin D is clearly effective in reaching the general population. Further researches and intervention regarding vitamin D could with an emphasis on measuring serum 25 (OH) D concentrations in adolescents who are at risk for vitamin D deficiency or insufficiency.

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Table (1): Cut-offs of Lab Indicators Used in the Study

Indicator	Cut offs	Reference	Outcome	
			No (120) *	**%**
PTH		***Martin, 1979***		
hypo-parathyroidism	0-6.4 pg/ml		**-**	**0.0**
Insufficiency	> 6.4-15.9pg/ml		**9**	**0.09**
Normal	16-46 pg/ml		**84**	**70.0**
pre-hyper-parathyroidism	47-106 pg/ml		**26**	**22.0**
hyperparathyroidism	> 106 pg/ml		**1**	**0.01**
Vitamin D		***Houghton, 2006***		
Deficiency VDD	< 10 ng/ml		**12**	**10.0**
Insufficiency VDI	10-29 ng/ml		**77**	**64.0**
Sufficiency VDS	30-100 ng/ml		**31**	**26.0**
toxicity	> 100 ng/ml		**---**	**0.0**
Calcium		***Sarkar and Chauhan, 1967***		
Hypo calcemia	< 9.2 mg/dl		**54**	**45.0**
Normal	9.2-11.0 mg/dl		**59**	**49.0**
Hyper calcemia	>11.0 mg/dl		**7**	**6.0**
Phosphorus		***Vassault, 1989***		
Hypo phosphatemia	<2.7 mg/dl		**--**	**0.0**
Normal	2.7-4.5 mg/dl		**63**	**52.5**
Hyper phosphatemia	> 4.5 mg/dl		**57**	**47.5**
Alkaline Phosphatase	Up to 270 U/L	***Tiets, 1995***	**120**	**100.0**

- ***120 out of 125 female participants had valid lab indicators***

Table (2): Frequency Distribution of Participants by their Vitamin D Status* per Season

Season	Vitamin D metabolic status						Total (120)		Chi square
	VDD/VDI		Hypocalcemia		VDS				
Winter	3	37.0	1	13.0	4	50.0	8	6.0	.006
Autumn	8	14.0	9	15.0	42	71.0	59	49.0	.006
Spring	11	26.0	16	38.0	15	36.0	42	35.0	.068

**Vitamin D Status is the classification of laboratory results based on the normal physiological PTH-VD axis using cut-offs of vitamin D, calcium, and phosphorus in relation to cut-offs of PTH. VDD=VD deficient VDI= VD insufficient VDS= VD sufficient*

Table (3): Frequency Distribution of Participants by their Vitamin D Status* and some Vitamin D- related Practices:

Vitamin D related-Practice	Vitamin D status*						Total		Chi square
	VDD/VDI		Hypocalcemia		VD Sufficient		No	%	
Skin hue (107)									
Fair	--		-		1	100.0	1	1.5%	NS
Dark	20 (84)	24.0	20 (84)	24.0	44 (84)	52.0	84	67.0%	NS
Black	2 (22)	9.0	6 (22)	27.0	14 (22)	64.0	22	18.0%	NS
Clothing (107)									
veiled	22 (103)	21.0	25 (103)	24.0	56 (103)	55.0	103	96.0%	NS
unveiled	---		1 (4)	25.0	3 (4)	25.0	4	4.0%	NS
Exposed part (99)									
Face and hand	20 (95)	21.0	22 (95)	23.0	53 (95)	56.0	95	96.0%	NS
Else	--	0.0	2 (4)	50.0	2 (95)	50.0	4	4.0%	NS
Exposure time (95)									
Before/after	2 (11)	18.0	3 (11)	27.0	6 (11)	55.0 45	11	12.0%	NS
Sun-set noon	18 (84)	21.0	21 (84)	25.0	(84)	54.0	84	88.0%	NS
Exposure duration (94)									
=< 1 hour	10 (41)	24.0	11 (41)	27.0	20 (41)	49.0	41	44.0%	NS
> 1 hour	10 (53)	19.0	13 (53)	25.0	30 (53)	56.0	53	56.0%	NS
Sun-block (99)									
Yes	15 (72)	21.0	15 (72)	21.0	42 (72)	58.0	72	73.0%	NS
No	5 (27)	19.0	9 (27)	33.0	13 (27)	48.0	27	27.0%	NS
Closed -window (96)									
Yes	10 (64)	16.0	20 (64)	31.0	34 (64)	53.0	64	67.0%	.063
No	10 (32)	31.0	4 (32)	13.0	18 (32)	56.0	32	33.0%	.056
Pesticid-exposure (97)									
Yes	17 (81)	21.0	19 (81)	23.0	45 (81)	56.0	81	84.0%	NS
No	2 (16)	13.0	4 (16)	25.0	10 (16)	62.0	16	16.0%	NS

***Vitamin D Status is the classification of laboratory results based on the normal physiological PTH-VD axis using cut-offs of vitamin D, calcium, and phosphorus in relation to cut-offs of PTH.*

Table (4): Frequency Distribution of Participants by some Vitamin D-related Knowledge:

Vitamin D –related Knowledge	Pre-test response (27)		Post-test response (125)	
	No	%	No	%
Have you ever heard about vitamin D?				
Yes	27	22.0	125	**100.0**
No	98	78.0	0	**0.0**
What is the importance of vitamin D?				
Bone integrity	24	90.0	123	**99.0**
Prevents anemia	0	0.0	2	**1.0**
Which is the *main* Vitamin D source?				
Sun ray	18	70.0	89	**70.9**
Fish	6	20.0	36	**29.1**
Dose Vitamin D has any relation to Sun?				
Yes	18	70.0	125	**100.0**
No	0	0.0	0	**0.0**
Is Vitamin D sufficient in food?				
Yes	7	24.3	86	**68.4**
No	14	53.4	38	**30.6**
Which is better as a Vitamin Dsource;				
Powder milk	3	10.2	118	**94.2**
Fluid Milk	21	80.1	5	**3.9**
Both are equal	3	10.0	2	**1.9**
Which is better as a Vitamin D source;				
Powder milk	3	10.0	112	**89.8**
Breast milk	24	90.0	11	**8.3**
Both are equal	0	0.0	2	**1.9**
Are Pregnant Females susceptible to vitamin D deficiency?				
Yes	18	70.0	120	**96.1**
No	3	10.0	3	**2.4**
Are girls susceptible to vitamin D deficiency?				
Yes	14	57.3	123	**99.0**
No	6	20.9	2	**1.0**
Why are they susceptible?				
Do not exposed to sun	**18**	**70.0**	**115**	**92.6**
Do not eat fish	**0**	**0.0**	**5**	**3.9**

***** All **"**do not know" responses were omitted

Table (5): Frequency Distribution of Participants by their pattern of milk and Dairy products' consumption in relation to area of descent:

Pattern	Rural (row %)		Urban (row %)		Total (column %)	
	No	**%**	**No**	**%**	**No**	**%**
Dairy frequency/day						
once	56	50.5	55	49.5	111	89.5
twice	6	46.2	7	53.8	13	10.5
	$X^2 = 0.086$ p = 1.000					
Type of Milk Fat						
Full milk	50	51.5	47	48.5	97	86.6
Partially skimmed	1	11.1	8	88.9	9	8.0
Skimmed	3	50.0	3	50.0	6	5.4
	$X^2 = 6.148$ p = 0.067					
Milk in Main meal						
Yes	17	53.1	15	46.9	32	28.1
No	39	47.6	43	52.4	82	71.9
	$X^2 = 2.85$ p = 0.678					
Milk in snacks						
Yes	31	47.7	34	52.3	65	58.6
No	24	52.2	22	47.8	46	41.4
	$X^2 = 0.216$ p = 0.702					
Reason for not consuming milk						
Costy	7	70.0	3	30.0	10	31.3
Dislike	15	68.2	7	31.8	22	68.7
	$X^2 = 0.011$ p = 1.000					

Table (6): Average Daily Food Intake presented as Median (IQR)* among participants in relation to number of calcium services per day:

Nutrients (RDA)**	1 Ca service (Up to 300 mg /day)	2 Ca services (> 300 to 600 mg/day)	3 Ca services (> 600 mg/day)
Calories (2200Kcal/day)**Median (IQ)**	1322.9 (887.0 – 1635.6)	1778.6 (1411.0 – 2217.0)	2134.9 (1762.0 – 2664.5)
Min - Max	427.5 – 2559.6	807.0 – 3395.0	1497.3 – 4188.0
Protein*** (42.1-50.8 g/day) **Median (IQ)**	47.0 (37.5 –59.0)	70.0 (56.4 – 80.0)	79.6 (68.0 –102.0)
Min --Max	13.0 – 121.0	31.0 – 141.0	53.0 – 175.9
Ca (1200 mg/day) **Median (IQ)**	221.0 (142.0 – 295.3)	459.0 (395.0 – 578.7)	794.0 (752.9 – 933.1)
Min - Max	64.0 – 329.0	345.8 – 665.0	669.0 – 2221.0
Pi (1250 mg/day) **Median (IQ)**	540.5 (422.0 – 829.4)	941.9 (808.0 – 1062.0)	1064.0 (920.2 – 1389.7)
Min - Max	168.0 – 1336.1	466.0 – 1957.3	278.0 – 2293.1
Ca / Pi **ratio** (2:1) **Median (IQ)**	0.3 (0.3 – 0.5)	0.5 (0.4 – 0.6)	0.7 (0.6 – 0.9)
Min - Max	0.1 – 0.8	0.2 – 1.1	0.4 – 3.6
Iron (29-31 mg/day) **Median (IQ)**	8.0 (6.0 – 13.5)	12.6 (9.0 – 16.3)	13.4 (11.0 – 18.0)
Min - Max	2.0 – 30.3	4.3 – 27.0	7.0 – 32.6
Zinc **(8 mg/day) Median (IQ)**	6.0 (5.0 – 8.5)	9.0 (7.5 – 11.0)	11.0 (10.0 – 13.1)
Min - Max	1.0 - 20.0	4.0 – 23.3	8.0 – 30.6

*** IQR= Inter-quartile range (2nd and 3rd quartiles including median value) (>= 25 % to =<75% of results)**

****RDA= recommended daily allowance based on WHO/FAO (2004) *** WHO/FAO/UNU (2007)**

Table (7): Non-parametric Correlation between Vitamin D status groups and some risky Factors

Risky factors	Vitamin D status*		
	Correlation coefficient	**Significance (1-tailed)**	**No**
Season **Autumn** **Spring**	 .32 -.28	 .000 .001	110 110
Age	- .057	.276	110
BMI	- .002	.49	110
Waist	- .028	.386	110
Meal No.	.085	.19	109
Ca services	- .104	.14	110
Milk (full cream)	- .035	.36	108
Cheese (natural)	- .002	.49	108
Fish	.14	**.07**	108
Egg	- .09	.17	108
Tea/ coffee	- .012	.17	108
Chipsy	- .059	.27	108
Cola	- .047	.33	91

***Vitamin D Status is the classification of laboratory results based on the normal physiological PTH-VD axis using cut-offs of vitamin D, calcium, and phosphorus in relation to cut-offs of PTH.*

المعرفة والسلوك والتوجهات وتأثيرها علي حالة فيتامين د لدي الطالبات الدارسات بالصف الأول الجامعي

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[٣] ماجستير في التغذية / قسم التغذية وعلوم الأطعمة/ كلية الاقتصاد المنزلي /جامعة حلوان (٢٠١٣)

المستخلص العربي

تم إجراء البحث لدراسة تأثير بعض العوامل الشخصية والسلوكية والبيئية على مستوى فيتامين (د) بين الطالبات الجامعيات في مصر. تم اختيار ١٢٥ طالبة جامعية مصرية من الصف الأول بجامعة حلوان. كانت الموافقات المكتوبة خطوة أساسية أولية. تم تسجيل بياناتهن الشخصية. تضمنت الدراسة: تقييم المؤشرات الجسمية (الأنثروبومترية) ومدي انعكاس الصفات البيولوجية كلون البشرة والسلوكيات المتعلقة بمده وكيفية التعرض للشمس والملبس علي حالة فيتامين د بينهن. التقييم الغذائي: تم استخدام استمارة استرجاع غذاء ٢٤ ساعة وتثقيفهم غذائيا وعمل استبيان لتقييم النمط الغذائي وكذلك التاريخ الغذائي. تم تقدير فيتامين د والمؤشرات ذات الصلة. تم تحليل تناول الطعام ومقارنته بالمكونات الغذائية الموصى بها باستخدام جدول مكونات الغذاء التابع للمعهد القومي للتغذية واستناداً إلى توصيات منظمة الصحة العالمية / منظمة الأغذية والزراعة. كشفت النتائج أن غالبية المشاركين (٩٦,٠٪) كانوا محجبات و ٨٨,٠٪ تعرضوا للشمس في وقت الظهيرة. كانت الوجه واليدين هي الأجزاء المكشوفة في ٩٦,٠ ٪ من الردود وذكر ٥٦,٠ ٪ أن التعرض لأشعة الشمس استغرق أكثر من ساعة. تم ذكر التعرض للمبيدات في ١٦,٠٪ من العينة. تعرض ما يقرب من الثلثين للشمس بينما كانت النوافذ مغلقة..٩٠٪، يتناولوا الحليب مرة واحدة يوميًا، بينما ثلثي الطالبات لا يفضلن تناول الحليب، بينما أعتبر الثلث الآخر الحليب من المواد الغذائية الباهظة الثمن. وخلصت هذه الدراسة إلى رفع مستوى وعي الشباب والشباب بهذه المشكلة. وأكدت هذه الدراسة على الحاجة إلى مزيد من تقييم فيتامين (د) والتدخلات التي تستهدف جميع الناس. هناك حاجة ملحة لتثقيف الجمهور حول الدور الحيوي لفيتامين (د) في تحسين الممارسة المتعلقة بالفيتامين (د) وتقليل مضاعفات نقصه إلى الحد الأدنى.

الكلمات المفتاحية: الوعي بفيتامين د ، الفتيات بسن المراهقة ، طالبات الجامعيات