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RESEARCH ARTICLE

VITAMIN D STATUS, KNOWLEDGE AND PRACTICE AMONG SAUDI FEMALE'S STUDENTS IN HAIL.

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Abstract

Background: Vitamin D deficiency which known as hypovitaminosis D is more serious problem. It is currently estimated that one billion people suffer from vitamin D deficiency worldwide. Vitamin D in nowadays one of the most important topics in research and clinics and the cause of vitamin D deficiency in Saudi Arabian female student could be related to many reasons. **Objectives:** the aim of this study was to assess the knowledge and practice of Saudi female students about vitamin D deficiency.

Methods: This study used a descriptive cross-sectional design to assess the knowledge and practice of Saudi female about vitamin D deficiency. The number of responders from secondary school is 340 and from university students are 467, total of 807 female students. The questionnaire used consists of 17 closed questions, arranged in 4 subscales. It includes two questions about the demographic characteristics; six questions about knowledge about vitamin D deficiency or increment, source of knowledge, four questions for knowledge about food rich in vitamin D, the relationship between vitamin D and calcium in the body, vitamin D deficiency causing tiredness, low mood and muscle and bone pain and the last five questions about suffering from diseases in the bones, expose of face, arms and legs to the sun, and finally if the females pregnant or lactating mothers and have vitamin D deficiency.

Results: For secondary school students, showed that most of participants (72.1%) have good knowledge about vitamin D deficiency compared to university students (78.6%). The source of knowledge about vitamin D deficiency varied, most from social media (19.4% Vs 24.4%), most of participants don't know the true level of blood vitamin D (60% Vs 52.9%) for secondary school and University students respectively. About 67.6% vs 35.8% know the dangerous of vitamin D deficiency and 18.8% Vs 40.9% know the dangerous of vitamin D increment, and 38.5% Vs 25.1% receive vitamin D without prescription for secondary school and University students respectively. About 69.7% Vs 77.9% not suffered from bone diseases, while (12.9% Vs 9.4% suffered from arthritis), (7.9% Vs 5.8% suffered from osteomalacia) and (9.4% Vs 6.9% suffered from osteoporosis) and

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about 45.9% Vs 43.3% don't expose to sun for secondary school & university students respectively.

Conclusion: Most of students either in secondary school or university, their knowledge about vitamin D is little and some of them suffer from bone diseases while they are still young and did not expose to sun.

Recommendations: Health awareness campaigns should be held to give advises to students in all stages about the importance of vitamin D and how they can protect themselves from its deficiency by eating healthy foods rich with vitamin D. Also advised them to be exposed to sun rays at the suitable times and did not take vitamin D without needs or without prescription.

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Introduction:-

Vitamin D in nowadays one of the most important topics in research and clinics, as well as in the life of every human who is concern about general health and would like to avoid the complication .The complications of vitamin D deficiency include Rickets, Osteoporosis, Depression and Fatigue, Hyperparathyroidism, Obesity, Osteomalacia, Chronic Backache, Hypertension, cancers, chronic pain, diabetes, multiple sclerosis or heart disease (**Solaiman, 2012**).

Vitamin D is a pro-hormone, and has an important role in bone mineral metabolism. It is now also recognized to have a role in cell differentiation, cell growth and modulation of immune system. (**Food and Nutrition Board, 1997**). There are two forms of vitamin D, cholecalciferol (vitamin D3) and ergocalciferol (vitamin D2). (**Habib et al, 2014**). We can take it from many sources such as sunlight, supplement and food. Even though there is little vitamin D found in food naturally, food considered another source of vitamin D, such as seafood, shrimp, mushroom, egg yolk and fortified milk (**Muhairi, 2013 & Moyed, 2009**). Sunlight Exposure is the major source of vitamin D. The efficiency of the conversion of 7-dehydrocholesterol to vitamin D3 is dependent on time of day, season of the year, skin color and age. (**Habib et al, 2014**). The daily requirement of vitamin D is about 200–600 IU². For a such long time, it has been observed worldwide Vitamin D dietary intake as inadequate. The problem of inadequate Vitamin D intake is most serious in the case of young women, as women under 30 years old were characterized by the lowest Vitamin D intake among the all age groups on the basis of the United States NHANES 2003–2006 data. (**Bailey et al., 2010**) In this days the young girls start to take care more about themselves so it makes them more prone to take any decision and the effect of social media make big influence. It is a common misconception that ‘vitamins’ are beneficial for health and cannot be potentially toxic. (**Hoff, 1980**). The characteristic laboratory findings of vitamin D intoxication are hypercalcaemia, hyperphosphataemia, elevated alkaline phosphatase, low PTH and high vitamin D level and is typically associated with hypercalciuria. Calcitriol (1,25(OH)2D3) has a short half-life; hence hypercalcaemia due to its toxicity usually lasts only 1–2 days. (**Ozkan et al. 2013**) [8] However, evidence indicates that prolonged intake of even 10 000 IU/day of vitamin D3 likely poses no risk; it could be because the synthesis of the active form, 1,25(OH)2D3 is tightly regulated. Because of this wide therapeutic index, vitamin D toxicity is extremely rare. However, the dose of vitamin D which will produce toxicity in an individual is variable, which could be due to vitamin D receptor polymorphisms (**McGrath et al., 2010**). In the other hand, Vitamin D deficiency which known as hypovitaminosis D is more serious problem. It is currently estimated that one billion people suffer from vitamin D deficiency worldwide (**Habib et al., 2014**). The cause of vitamin D deficiency in Saudi Arabian female student could be related to many reasons and the aim of this study was to assess the knowledge and practice of Saudi female about vitamin D deficiency.

Materials and Methods:-

Sample and study area

This study used a descriptive cross-sectional design to assess the knowledge and practice of Saudi female about vitamin D deficiency. Non probability Convenience sample of Saudi Females aged 18 and above were included in the study. The inclusion criteria are: (1) Saudi nationality (2) female, (3) age 18 and above. Those who met inclusion criteria and accept to participate were included in the study. The subjects were recruited from school and colleges in Hail city, Saudi Arabia. The participants were aware about the aim of the study, and they were informed that the participation is voluntary. Verbal agreements (consents) were taken before data collection. The subjects were informed that the data will be anonymous and confidential and they have the freedom to withdraw from the study

any time. The number of responders from secondary school is 340 and from university students are 467, total of 807 female students. In this study, questionnaire is used, which included Socio-demographic age and education, the second tool, was Knowledge and Practice Assessment Questionnaire.

Instruments

The questionnaire consists of 17 closed questions, arranged in 4 subscales. It includes two questions about the demographic characteristics; six questions about knowledge about vitamin D deficiency or increment, source of knowledge, four questions for knowledge about food rich in vitamin D, the relationship between vitamin D and calcium in the body, vitamin D deficiency causing tiredness, low mood and muscle and bone pain and the last five questions about suffering from diseases in the bones, expose of face, arms and legs to the sun, and finally if the females pregnant or lactating mothers and have vitamin D deficiency.

Statistical analysis

Data was coded, entered, and analyzed using the Statistical Package for Social Science (SPSS) version 22.

Results:-

The number of participants in this study was 807 students, 340 of them from secondary school students and 467 from university students. For secondary school, about 340 students were responding to the questionnaire, their ages ranged from 16 to 18-year-old (305, 89.7%) and from 19 to 20 years old (35, 10.3%). The participants from university students, their ages ranged from 19 to 20-year-old (63, 13.5%) from 21 to 23 years old (143, 30.6%), from 24 to 25 years old (95, 20.3%), and from 26 to 30 years old (166, 35.6%). Table (1) and Figure (1) for secondary school students, showed that most of participants (72.1%) have good knowledge about vitamin D deficiency, while only 27.9% don't know. The source of knowledge about vitamin D deficiency varied, most from social media (19.4%), from books and readings (17.4%), from friends (14.1%), from mothers (12.9%) and from their study (6.8%) (Figure 2). Most of participants don't know the true level of blood vitamin D (60%), while 18.8% said < 28 IU, 12.6% said > 28 IU and 8.5% said equal 28 IU (Figure 3). The answers on the 4th and 5th question, 67.6% know the dangerous of vitamin D deficiency and 18.8% know the dangerous of vitamin D increment. Only 38.5% receive vitamin D without prescription while 61.5% did not receive vitamin D without prescription. For university students, **Table (1) and Figure (1)** showed that most of participants (78.6%) have good knowledge about vitamin D deficiency, while only 21.4% don't know. The source of knowledge about vitamin D deficiency varied, most from social media (24.4%), from mothers (11.9%) from friends (9.9%), and from their study (9.9%) from books and readings (9.6%) (Figure 2). Most of participants don't know the true level of blood vitamin D (52.9%), while 22.9% said < 28 IU, 17.3% said > 28 IU and 6.9% said equal 28 IU (Figure 3). The answers on the fourth and fifth question, 35.8% know the dangerous of vitamin D deficiency and 40.9% know the dangerous of vitamin D increment. Only 25.1% receive vitamin D without prescription while 74.9% did not receive vitamin D without prescription.

Table 1:- Numbers and percentages of students' knowledge about vitamin D deficiency and increment and their dangerous, questions and responses in (n= 340, Secondary school students), (n= 476, University students), in Hail region, Saudi Arabia.

Question No.	Students	n (%)					
		YES			NO		
1- Do you have knowledge about Vitamin D deficiency?		245 (72.1)			95 (27.9)		
	Secondary School	245 (72.1)			95 (27.9)		
	University	367 (78.6)			100 (21.4)		
2 - Sources of knowledge about Vitamin D deficiency.		Mothers	Friends	Books & readings	Study	Social Media	Others
	Secondary School	44 (12.9)	48 (14.1)	59 (17.4)	23 (6.8)	66 (19.4)	100 (29.4)
	University	56 (11.9)	46 (9.9)	45 (9.6)	46 (9.9)	114 (24.4)	160 (34.3)
3- Do you know the normal blood level of vitamin D?		< 28 IU	=28 IU	> 28 IU		Don't Know	
	Secondary School	64 (18.8)	29 (8.5)	43 (12.6)		204 (60.0)	

	University	107 (22.9)	32 (6.9)	81 (17.3)	247 (52.9)
4 - Do you know how dangerous vitamin D deficiency?		YES		NO	
	Secondary School	230 (67.6)		110 (32.4)	
	University	167 (35.8)		300 (64.2)	
5 - Do you know how dangerous vitamin D increment?		YES		NO	
	Secondary School	64 (18.8)		276 (81.2)	
	University	191 (40.9)		276 (59.1)	
6- Did you receive vitamin D without prescription?		YES		NO	
	Secondary School	131 (38.5)		209 (61.5)	
	University	117 (25.1)		350 (74.9)	

n: number of students

(%): Percentage of students

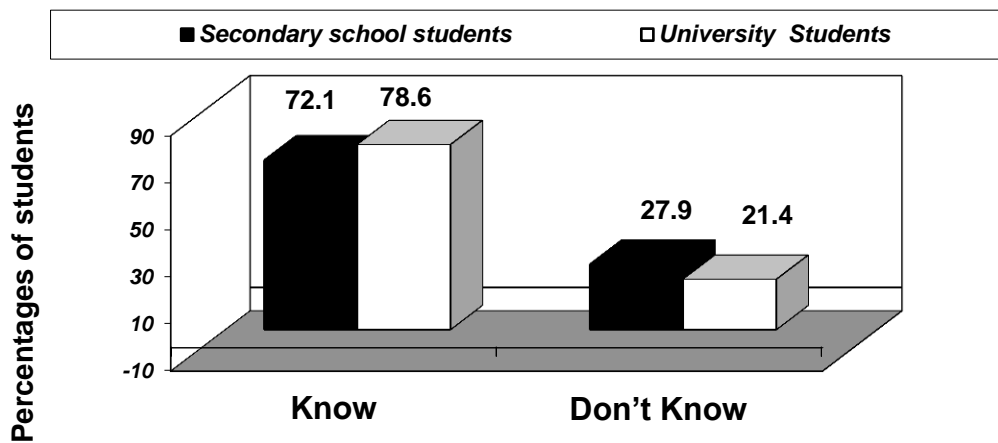


Figure 1. The percentages of students knowleges about the vitamin D deiciency.

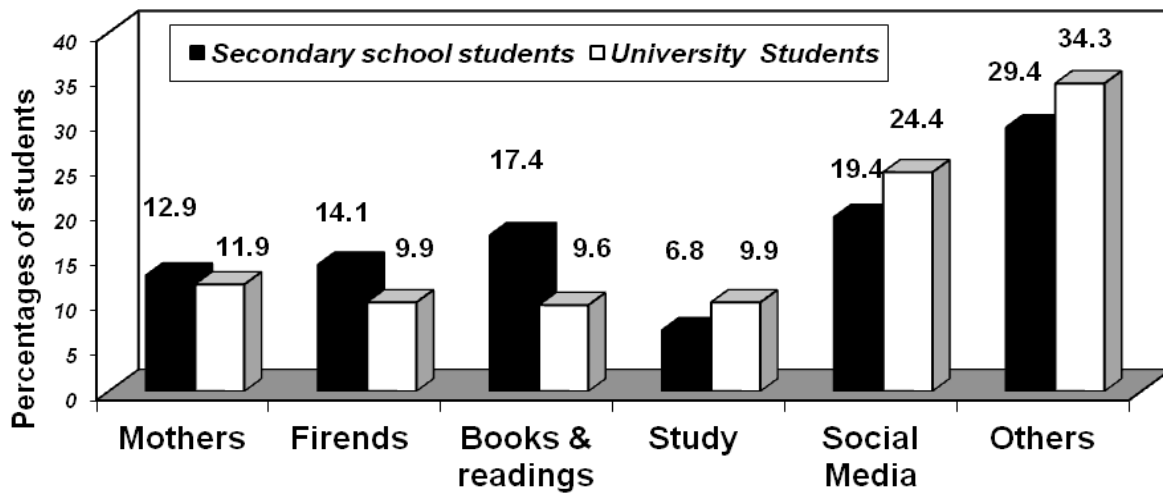


Figure 2. The percentages of student sources of knowlege about the Vitamin D deiciency.

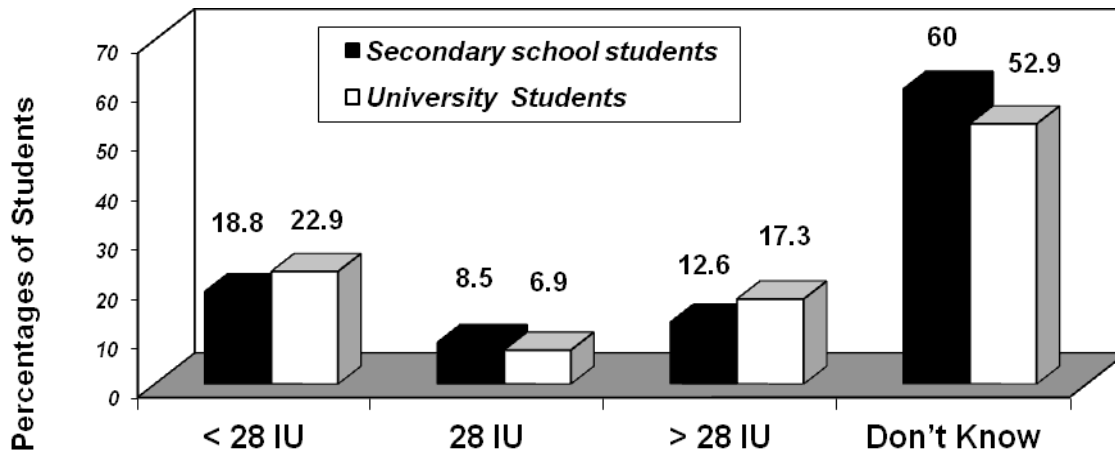


Figure 3. The percentages of students' knowledges about the blood level of Vitamin D.

Table (2) and Figure (4) for secondary school students, about 60.6% eat a food that rich in vitamin D such as milk, fish oil or eggs in your meal, approximately the same percent was in university students (61.5%). Answer was yes of question 8 about the relationship between vitamin D and calcium in the body, secondary school (75.3%) compared to (44.1%) for university students.

About 51.5% take supplements contain vitamin D (secondary school) while only 36.4% from university students. Answer of question 10 concerning that vitamin D deficiency causes tiredness, low mood and muscle and bone pain, 45% of secondary school students and 68.3% of university students knowing this knowledge, while 49.7% and 21.2% don't know (Figure 5).

Table 2:- Numbers and percentages of participant knowledge's about vitamin D rich foods, relationship between vitamin D deficiency and calcium level in the body and low mood and muscle and bone pain, questions and responses in (n= 340, Secondary school students), (n= 476, University students), in Hail region, Saudi Arabia.

Question No.	Students	n (%)		
		YES	NO	Don't Know
7- Do you eat a food that rich in vitamin D such as milk, fish oil or eggs in your meal?				
	Secondary School	206 (60.6)	134 (39.4)	
	University	287 (61.5)	180 (38.5)	
8 - Do you think there is a relationship between vitamin D and calcium in the body?				
	Secondary School	256 (75.3)	84 (24.7)	
	University	206 (44.1)	261 (55.9)	
9- Do you take supplements contain vitamin D?				
	Secondary School	175 (51.5)	165 (48.5)	
	University	170 (36.4)	297 (63.6)	
10 - Do you know that vitamin D deficiency causes tiredness, low mood and muscle and bone pain?				
	Secondary School	153 (45.0)	18 (5.3)	169 (49.7)
	University	319 (68.3)	49 (10.5)	99 (21.2)

n: number of students

(%): Percentage of students

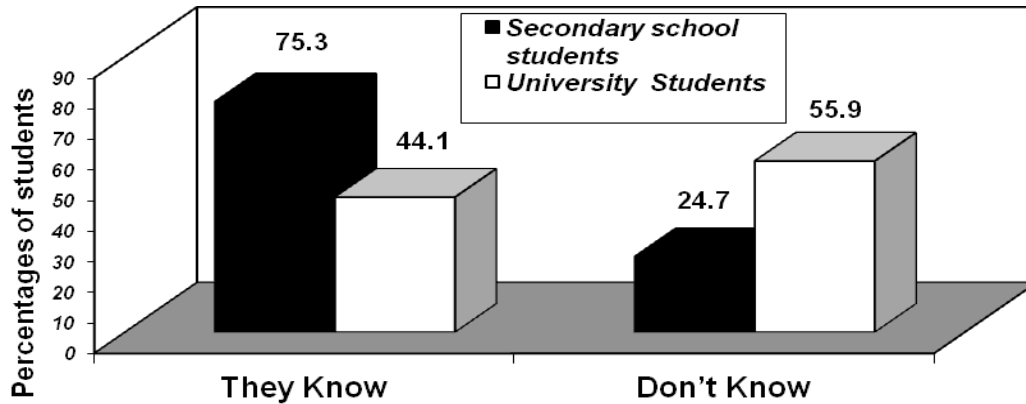


Figure 4. The percentages of students' knowledges about the relationship between vitamin D and calcium in the body

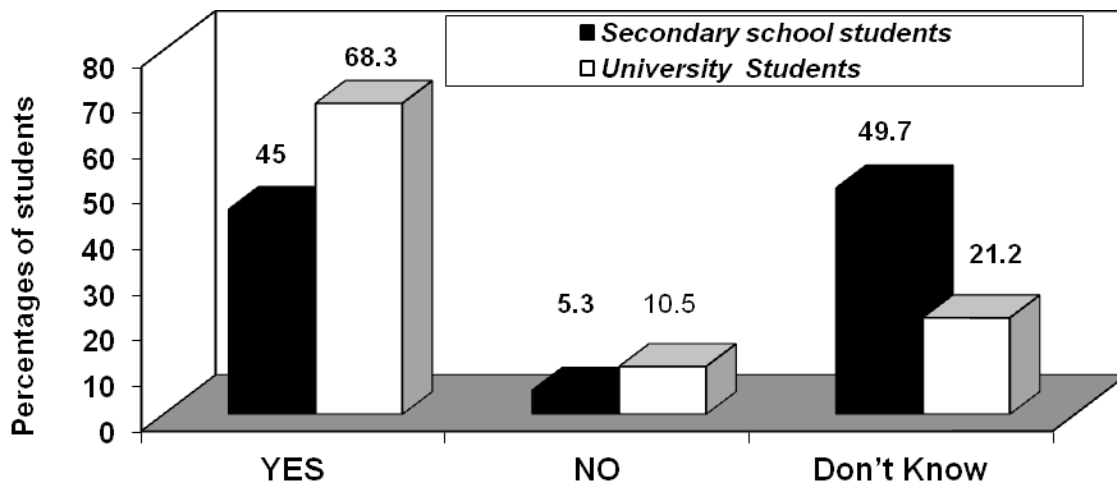


Figure 5. The percentages of students' knowledges about that vitamin D deficiency causes tiredness, low mood and muscle and bone pain

Table (3) and Figure (6) showed that 45% of secondary school students and 59.7% of university students measure their vitamin D level. About 69.7% of secondary school students and 77.9% of university students not suffered from bone diseases, while (12.9% & 9.4% suffered from arthritis, (7.9% & 5.8% suffered from osteomalacia) and (9.4% & 6.9% suffered from osteoporosis) for secondary school students & university students respectively (Figure 7). About 45.9% & 43.3% don't expose to sun for secondary school students & university students respectively, while (19.4% & 20.1% expose for sun once per week), (27.6% & 19.1% expose for sun twice per week) and (7.1% & 19.5% expose for sun three times per week) for secondary school students & university students respectively (Figure 8). Concerning answer about question no. 15, small number of participant pregnant or lactating and don't suffer from vitamin D deficiency (0.6%), also, small number of participant pregnant or lactating and suffer from vitamin D deficiency (0.3%) while 98.2% & 98.4% not pregnant or lactating (Figure 9).

Table 3:- Numbers and percentages of participant knowledge's about level of Vitamin D and pregnancy and lactation and suffering from bone diseases, questions and responses in (n= 340, Secondary school students), (n= 476, University students), in Hail region, Saudi Arabia.

Question No.	Students	n (%)				
		YES		NO		
11- Have you ever had a test to measure your vitamin D level?		YES		NO		
	Secondary School	153 (45.0)		187 (55.0)		
	University	279 (59.7)		188 (40.3)		
12 - Do you suffer from diseases in the bones?		YES, Arthritis	YES, Osteomalacia	YES, Osteoporosis	Don't suffer	
	Secondary School	44 (12.9)	27 (7.9)	32 (9.4)	237 (69.7)	
	University	44 (9.4)	27 (5.8)	32 (6.9)	364 (77.9)	
13- Is there anyone in your family have a vitamin D deficiency?		YES		NO	Don't Know	
	Secondary School	228 (67.1)		58 (17.1)	54 (15.8)	
	University	270 (57.8)		100 (41.4)	97 (20.8)	
14 - Do you expose your face, arms and legs to the sun?		Don't Expose	YES, once/week	YES, twice/week	YES, three times/week	
	Secondary School	156 (45.9)	66 (19.4)	94 (27.6)	24 (7.1)	
	University	202 (43.3)	94 (20.1)	89 (19.1)	91 (19.5)	
15- If you are a female, are you pregnant or breastfeeding and have vitamin D deficiency.		Pregnant, don't suffer from Vit D deficiency	Pregnant, and suffer from Vit D deficiency	Lactating, don't suffer from Vit D deficiency	Lactating, and suffer from Vit D deficiency	Not pregnant or Lactating
	Secondary School	2 (0.6)	1 (0.3)	2 (0.6)	1 (0.3)	334 (98.2)
	University	2 (0.4)	1 (0.2)	2 (0.4)	1 (0.2)	461 (98.8)

n: number of students

(%): Percentage of students

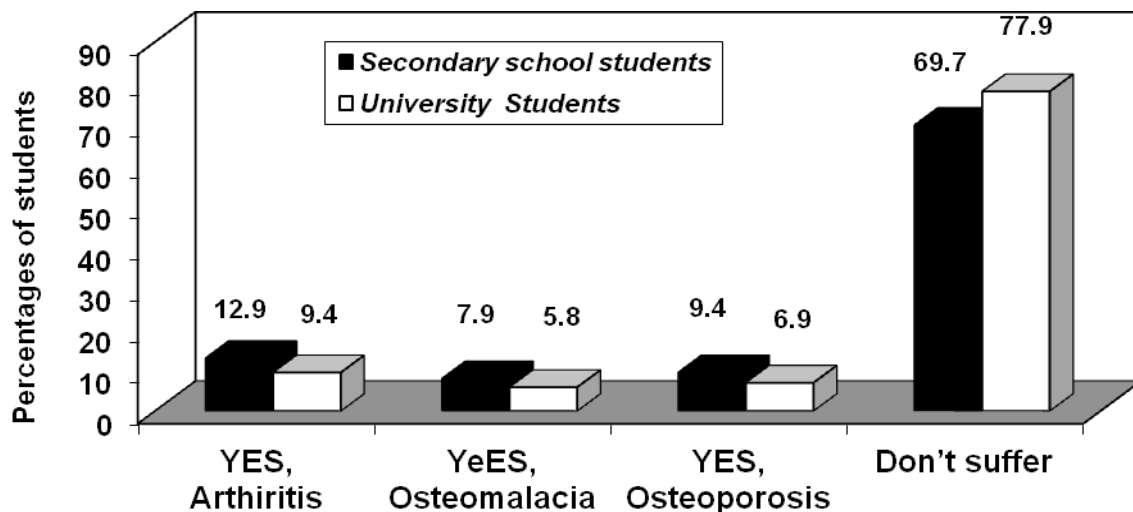


Figure 6. The percentages of students that measure their vitamin D level.

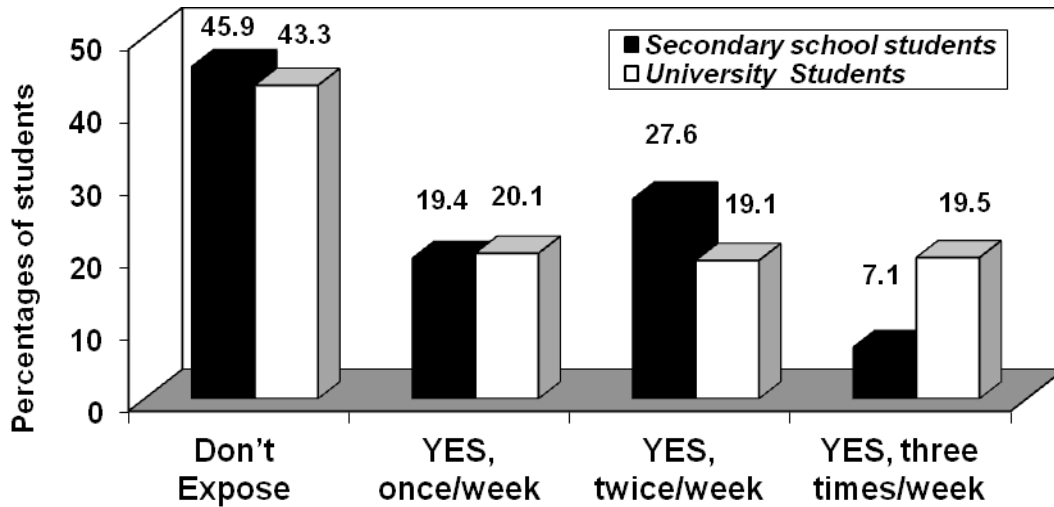


Figure 7. The percentages of students that suffer from diseases in the bones.

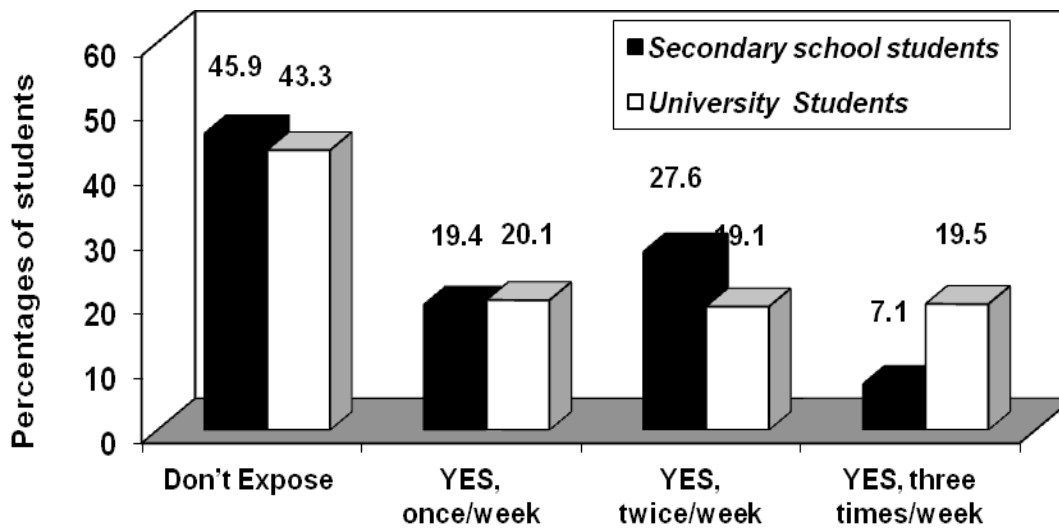


Figure 8. The percentages of students if they are exposed their face, arms and legs to the sun.

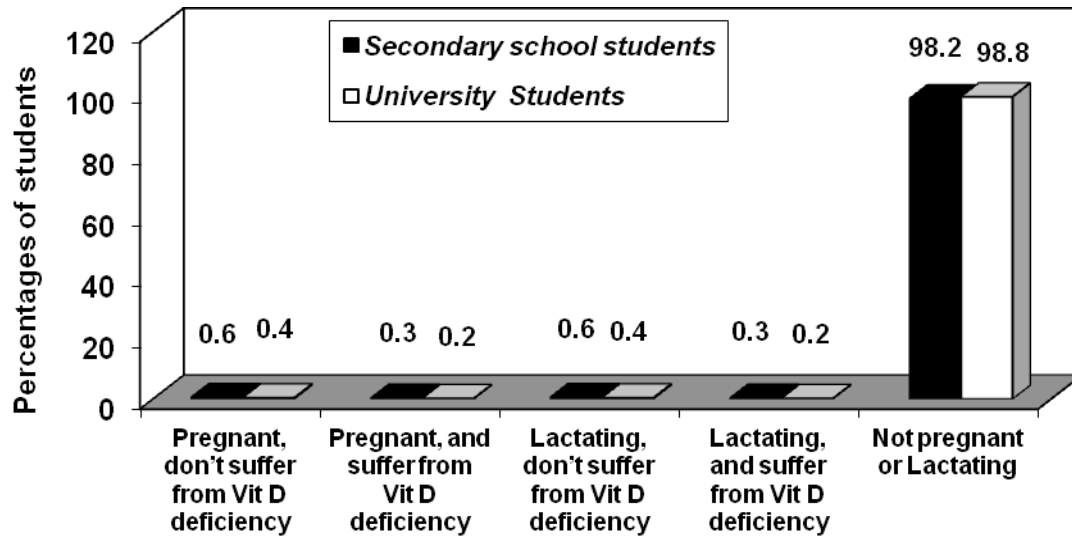


Figure 9. The percentages of students if they are pregnant or breast feeding and have vitamin D deficiency.

Discussion:-

In our study, the participants from Secondary School and University students (as average percentages) were asked if they have any information about vitamin D, (75.35%) of them responded with yes, (24.65%) with no. while on other study by **Habib et al. (2014)** aimed to assess the knowledge and practice of Saudi women about Vitamin D. They said 310 Saudi females were interviewed to assess their knowledge and practice. Only 14.2% of the subjects had good knowledge about vitamin D. The rest (85.8%) of the subjects either had bad or fair knowledge. In other study conducted in Saudi Arabia, they found that participants were limited in their knowledge about vitamin D and its deficiency **Christie & Mason (2011)**.

Concerning the source of information about vitamin D Deficiency, our results found that the social media (21.9%), books (13.5%), mothers (12.4%), friends (12%) and study (8.35%). In other study they said the main source of knowledge about vitamin D was doctors 37.4%, followed by TV program (34.8%), and internet (32%) (**Al -Bathi et al., 2011**). They studied knowledge, attitude and practice of patients attending primary care centers toward vitamin D in Kuwait. He found that the main sources of knowledge about vitamin D, 40.5 % of patients got knowledge from doctors, 12.5% from the media, 29.0% from relatives and friends, 8.5% from background information and 9.5% from journals and magazine (**Al- Bathi et al., 2011**). However, another study showed that a third of participants had received information about Vitamin D from family or friends. While the social connections of older at-risk people may differ from this group, community networks appear to be a promising vector for the dissemination of education about this important problem. The group with greatest need for education are also more likely than the general population to consult their GP, and this may also prove an important source of education (**Alemu & Varnam, 2012**).

Most of participants in the current study did not measure their vitamin D or calcium levels in blood, but they believe that they suffer from vitamin D or calcium deficiency. Because they are suffered from symptoms of its deficiency while they are in young age, which may due to lack physical activity or nutritional deficiency. Also, asymptomatic Vitamin D deficiency is also common. The monetary cost of vitamin D blood level measurement may not be affordable from all (**Naveed et al., 2016**).

However, our study showed that only 7.7% of participants think the normal blood level of vitamin D equal 28, about 14.95% said > 28 but 20.85% said < 28, and 56.45% did not know. While **Habib et al. (2014)** said that only 0.65% of the participants knew the normal level of Vitamin D in the adults.

In the current study, the participant that know about dangerous of vitamin D deficiency are, about half of them have knowledges about dangerous of vitamin D deficiency, and this knowledges from reading books, journal and social media.

In this study the participants were asked did they know the risk of increasing the proportion of vitamin D, 29.85% of them responded with yes. Also, we asked them if they have ever taken vitamin D without a prescription, 31.8% of them said yes. As the daily requirement of vitamin D is about 200–600 IU, the current upper intake level in both Europe and North America is 50 µg/day (2000 IU/day) (**Hathcock et al., 2007**). However, evidence indicates that prolonged intake of even 10000 IU/day of vitamin D3 likely poses no risk; it could be because the synthesis of the active form, 1,25(OH)2D3 is tightly regulated. Because of this wide therapeutic index, vitamin D toxicity is extremely rare. However, the dose of vitamin D which will produce toxicity in an individual is variable, which could be due to vitamin D receptor polymorphisms. (**McGrath et al., 2010 & Hathcock et al., 2007**). Symptoms of vitamin D toxicity depend on age of the patient, level and duration of hypercalcemia. Severity of hypercalcemia is defined as, <12 mg/dL is mild, between 12 and 14 mg/dL is moderate and >14 mg/dL is severe (**Ferris et al., 1971**). As regards this study, the participants were asked whether they eat food that rich in vitamin D. Among the respondents, (61.05%) said yes. A study conducted by **Alemu & Varnam (2012)** reported A 143 participants (89%) included Vitamin D rich foods such as milk, fish or eggs in their meals.

In this research, revealed that 59.7% of participants think there are a relationship between Vitamin D and Calcium in the body, which is similar to the findings in systematic review in 2009 concerning vitamin D, calcium, or a combination of both nutrients on the different health outcomes were inconsistent. Synthesizing a dose-response relation between intake of either vitamin D, calcium, or both nutrients and health outcomes in this heterogeneous body of literature proved challenging (**Chung et al., 2009**).

Our study showed that about 43.95% of participants take supplementary contain Vitamin D. Similar study conducted in 2016 showed that the inadequate intake of Vitamin D among participants, where 71% to 89% were characterized by an intake below the recommended value (**Głabska et al 2016**). Another study showed that, calcium supplementation should be less than 1200 mg per day (**Harvey et al., 1988**).

Our study showed that 56.65% of the participants think that Vitamin D deficiency can cause tiredness, low mood and muscles and bone pain; Similar study conducted in UK showed that about 46% of participants were aware of the symptoms of Vitamin D deficiency such as tiredness, low mood and muscles and bone pain (**Alemu & Varnam, 2012**).

In our study, the participants were asked if had test to measure vitamin D level, 52.35% of them said yes. In Poland, the inadequate intake of Vitamin D among young women is commonly reported, and, according to various studies, 71% (**Przysławski et al., 2012**) to 89% (**Wyka et al., 2008**) of young women were characterized by an intake below the recommended value. Also, asked if they suffer from disease in their bones, (73.8%) of them responded with no, (8.15%) responded they have osteoporosis, (6.85%) responded they have osteomalacia and (11.15%) responded they have arthritis. Similar studies have the same complications of vitamin D deficiency as the osteoporosis and osteomalacia (**Solaiman, 2012**).

In the current study the participants were asked is there anyone in your family have a vitamin D deficiency (62.45%) of them responded with yes, (29.25%) with no, (18.3%) with I don't know. As the Individuals with a history of vitamin deficiency in their family may will have vitamin D deficiency. The international consortium of researchers and doctors has identified four gene variants that may play a role in vitamin D deficiency and that inheriting one or more of them can make a person more than twice as likely to have insufficient levels of the vitamin (**Woznicki, 2010**).

In this study, the participants expose face, arms and legs only once a week (19.75%), twice a week (23.35%) and three time per week (13.3%), while (44.6%) did not expose to sun. Similar study showed that about one quarter of the sample (25.2%) exposed to sun less than 10 minutes per day that main (**Habib et al., 2014**). In the current study 44.6% of the participant did not expose to sun daily. Similar study was conducted in Saudi Arabia, it was 8found that participants were limited in their knowledge about vitamin D and vitamin D deficiency. They reported that exposure to sun was limited due to intense heat, cultural reasons for covering the body, and an infrastructure that makes sun exposure was difficult (**Christie & Mason, 2011**).

As regards this study, the participants were asked whether they pregnant or breastfeeding and have vitamin D deficiency. Among the respondents, 0.6% don't suffer from Vit D deficiency is pregnant and lactating female for both Secondary School and University students. And 0.3% is pregnant and lactating female suffer from Vit D deficiency for Secondary School. For University student, 0.4% who suffer, while 98.2% & 98.4% not pregnant or lactating. Previous studies have shown that vitamin D deficiency is common in pregnant women in Turkey (Alagöl et al., 2000), found that vitamin D levels were low in 66.6% of women of reproductive age in İstanbul (Pehlivan et al., 2003). In a study from Egypt, reported that only 35.8% of pregnant women had blood levels over 20 ng/mL (Aly et al., 2013).

Conclusion:-

Most of students either in secondary school or university, their knowledge about vitamin D is little and some of them suffer from bone diseases while they are still young and did not expose to sun or by eating healthy foods rich with vitamin D.

Recommendations:-

Health awareness campaigns should be held to give advises to students in all stages about the importance of vitamin D and how they can protect themselves from its deficiency by eating healthy foods rich with vitamin D. Also advised them to be exposed to sun rays at the suitable times and did not take vitamin D without needs or without prescription.

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