



زانكۆی سه‌لاحه‌دین - هه‌ولێر
Salahaddin University-Erbil

Vitamin D Status of the Third Stage Biology Students/Education College/Salahaddin University-Erbil

Research Project

Submitted to the department of Biology in partial fulfillment of the
requirements for the degree of BSc. in biology

By: Shaima Halmat Ahmad

Supervised by:

Lecturer: Israa Mahmood M.

April-2023

DECLARATION

I declare that the research entitled **Vitamin D Status of the Third Stage Biology Students/Education College/Salahaddin University-Erbil** is my own original work, and hereby certify that unless stated, all work contained within this research is my own independent research and has not been submitted for the award of any other degree at any institution, except where due acknowledgement is made in the text.

Signature:

Student Name: **Shaima Halmat Ahmad**

Date: /04/2023

SUPERVISION CERTIFICATE

This research has been written under my supervision and has been submitted for the award of the degree of bachelors of Science in Biology with my approval as a supervisor

Signature:

Name of Lecturer: **Israa Mahmood M.**

Date: /04/2023

I confirm that all the requirements have been fulfilled.

Signature:

Name: Asst. Prof. Dr Kazhal Muhammad Suleiman

Head of the Department of Biology

Date: / 04/2023

DEDICATION

I dedicate this work to:

My parents who are always support me in all aspects of my life.

My dear sisters and my brother who always wish to see me success.

My teachers and all those who taught me one day.

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First of all, I wish express my thanks to the most gracious "ALLAH", that led to easy for me to cross the barriers.

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Finally, I express my gratitude to my family for their supporting me during period of my work.

Abstract

It is noteworthy to say that vitamins play an important role to the operation of human body, therefore this study designed to evaluate the serum vitamin d level of the third stage biology students of education college/ Salahaddin university, to compare between male and female vitamin d level, as well as to determine the most common causes and symptoms associated with hypovitaminosis D and finally to spread awareness among students about the importance of this vitamin. Forty young adult students participated in our investigation. Their ages were between (20-21) years. Vitamin D evaluated and the questionnaire form had been prepared for data collection. A significant difference has been detected between mean value of vitamin D level of male, female, respectively were 22.55 ± 2.72 ng/ml and 13.83 ± 1.13 ng/ml at P value 0.05. The most common symptoms appeared among them were respectively in male, female and total were as follow: Hair loss (10%; 77.5% ; 87.5%), Musculoskeletal pain (2.5% ; 47.5% ; 50%). In conclusion: Majority of students suffered from vitamin D deficiency, especially female was more than male. Low sun exposure due to traditional Islamic veils, as well as low awareness about the regular checking of this vitamin to take supplements were the most common causes of vitamin D deficiency

Key words: Hypovitaminosis D, Sources of vitamin D, Symptoms of vitamin D deficiency.

List of content

SUBJECT	Page NO.
Title of research	I
Declaration	I I
Supervision Certification	I I I
Dedication	IV
Acknowledgements	V
Abstract	VI
List of Contents	VII
1.Introduction	1-2
2. Methodology	3-5
3.Result and discussion	6-13
3.1 -Vitamin D level of participants	6-7
3.2 Symptoms of vitamin D deficiency	7-9
3.3 BMI of participants	9-10
3.4.1 Sun exposure	10-13
3.4.2 Sunscreen usage	10
3.4.3 Sources of vitamin D	11-13
3.4.4 Health status and vitamin D level	13
4-conclusion	14
5- References	14-16

1. Introduction

Vitamin D is essential for bone health. It is required to absorb calcium and phosphorus into the body, it is a hormone and can be produced in the body. About 90% of it comes from sunlight, When the skin is exposed to the ultraviolet B (UVB) contained in sunlight, it converts 7-dehydrocholesterol in the deep epidermal layers of the skin to the provitamin colecalciferol (vitamin D₃). Colecalciferol is transported to the liver and converted to 25-hydroxyvitamin D (25(OH)D). This is then metabolized in the kidneys to the active form 1,25-dihydroxyvitamin D (1,25(OH)₂D) or calcitriol. There are some dietary sources of vitamin D. Small amounts are found in oily fish (salmon, and tuna) and even smaller amounts in egg yolk and red meat (Cowbrough, 2015).

In fact, Sun induced vitamin D synthesis is greatly influenced by season, time of day, latitude, altitude, air pollution, skin pigmentation, sunscreen use, passing through glass and plastic. (Wacker and Holick, 2013). According to McCarty *et al.*, (2012) low serum levels of vitamin D is common in patients with sleep disorders. This may be caused by chronic pains leading to sleep disorder. It was reported in this study that more than 50% of patients with physical pains and sleep disorder suffer from vitamin D deficiency.

The role of vitamin D in improvement of function of neurons system is approved by presence of 25(OH) active D₃-1 α -Hydroxylase enzyme which is responsible for forming active form of vitamin D (Eyles *et al.*, 2005). Existence of vitamin D receptors in brain, especially in hypothalamus and dopaminergic neurons in substantia nigra (Khanal *et al.*, 2008).

Furthermore, vitamin D deficiency in children causes growth retardation and classic signs and symptoms of rickets. In adults, vitamin D deficiency will precipitate and exacerbate osteoporosis and increase the risk of fracture (Holick and Chen., 2008). If the serum levels of vitamin D are sufficient (≥ 30 ng/mL), insufficiency (21–29 ng/mL), deficiency (≤ 20 ng/mL) (Piotrowska *et al.*, 2016) .

Since hypovitaminosis D is a common problem in our region therefore, we have performed this investigation to:

- 1-Evaluate the serum vitamin D level of the third stage biology students of Education college, Salahaddin university-Erbil.
- 2-Compare between vitamin D level of male and female students.
- 3-Determine the most common causes and symptoms associated with this vitamin.
- 4-Spread awareness among students about the importance of vitamin D.

2.Methodology

Study participants: forty young adult students participated in our investigation, included: 30(75%) covered female, 2(5%) non covered female and 8(20%) male (Fig. 2.1). They were aged between (20-21) years, our study performed at Salahaddin University- College of Education – Biology Department, from October 2022 to November 2022. Questionnaire form had been prepared to collect the following data: demographic information such as (sex and age), also knowledge about the most common symptoms of vitamin D deficiency if present, life style and health disorder.

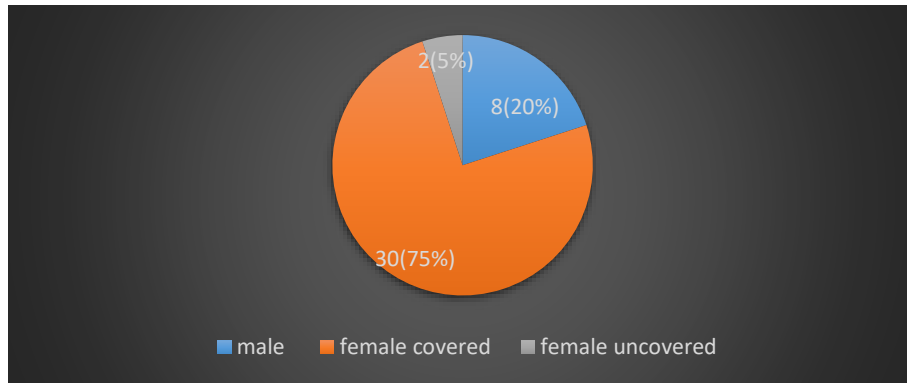


Figure 2.1 shows percentage and distribution of participants according to sex

Blood collection: we collected blood samples from participants by intravenous injection and store them in test tubes without EDTA, then transfer the samples to medical laboratory for biochemical analysis.

Anthropometrics: weight (Kg) was measured by using electronic scale and height (m) by using meter scale and BMI was calculated as the ratio between weight (Kg) and height in meters squared. BMI at 18.5 – 24.9 was considered as normal, 25 – 29.9 as overweight and ≥ 30 was considered as obese. (Al-Horani *et al.*, 2016).

Statistical analyses: vitamin D level and BMI were expressed as mean \pm standard error and statistical analysis was carried out using statistically available software statistical package for the social sciences (SPSS version 26). Statistical differences were determined by un-paired sample t-test for comparisons between two groups. $P < 0.05$ was considered statistically significant. Graph pad software (version 9) used to express the data by charts. The remaining data were expressed by percentage.

Questionnaire form about (Vitamin D Status of the Third Stage Biology Students/Education College/Salahaddin University-Erbil

1-Demographic questions

Date of birth.....

Sex : Male ☐ Female (covered ☐ non covered ☐)

2-General questions

1.Vitamin D level

2.BMI

Length.....

Weight.....

3.Do you suffer from the following conditions or (symptoms)?

a. hair loss	Yes <input type="checkbox"/>	No <input type="checkbox"/>
b. tooth problem	Yes <input type="checkbox"/>	No <input type="checkbox"/>
c. low immunity	Yes <input type="checkbox"/>	No <input type="checkbox"/>
d. vision problem	Yes <input type="checkbox"/>	No <input type="checkbox"/>
e. melanonychia	Yes <input type="checkbox"/>	No <input type="checkbox"/>

- | | | |
|--|------------------------------|-----------------------------|
| f. Insomnia (sleeping disorder) | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| g. Hard breathing | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| h. Intestinal disorder | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| i. Loss of appetite | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| j. Musculoskeletal pain | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| k. Any other health defects or disease | Yes | No <input type="checkbox"/> |

4. Your daily sun exposure

- a. less than 15 min/d
- b. 15 min/d
- c. More than 15 min/d

5. Do you use sunscreen? Yes ☐ No ☐

6. Do you consume the following regularly every week?

- | | | |
|---------------|------------------------------|-----------------------------|
| 1. Egg | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 2. Fish | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 3. Meat | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 4. Milk | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 5. Supplement | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

3. Result and discussion

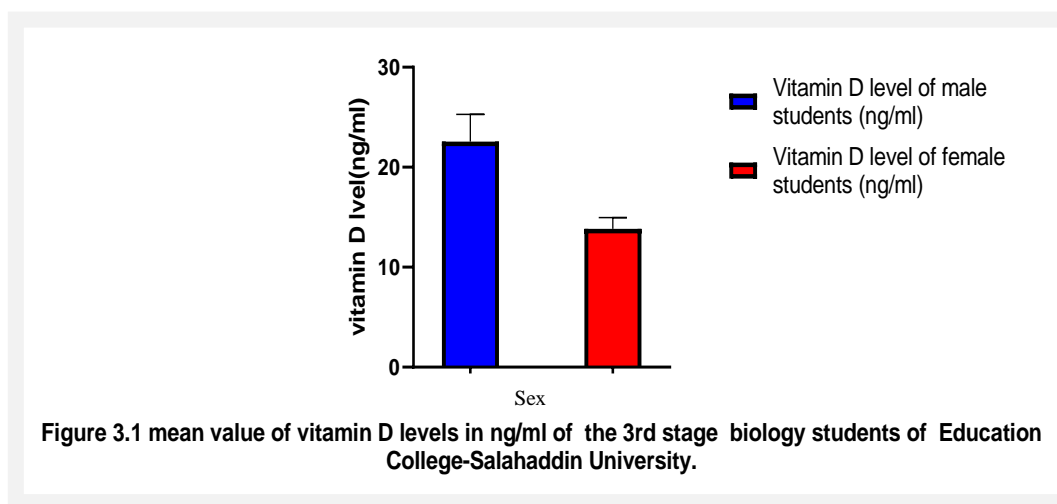
3.1 Vitamin D level of participants:

As showed in table 3.1, high ratio of students suffered from vitamin D deficiency 77.5% include: 7.5% male; 70% female), while 15% include (7.5% male; 7.5% female) vitamin D level were insufficient, only 7.5% including (5% male; 2.5% female) had sufficient level of this vitamin.

Table 3.1 Distribution and percentage of students according to gender and vitamin D level

	>30 ng/ml sufficient	20-30 ng/ml insufficient	<20 ng/ml deficient
Male	2 (5 %)	3 (7.5%)	3 (7.5%)
Female	1 (2.5%)	3 (7.5%)	28 (70%)
Total	3 (7.5%)	6 (15%)	31 (77.5%)

Furthermore, a significant difference was detected between mean value of vitamin D level of male and female as mean \pm standard error were respectively 22.55 ± 2.72 ng/ml and 13.83 ± 1.13 ng/ml at P value 0.05 (Fig 3.1).




Our results showed that mean vitamin D level of male students was higher than female, and most of the female were covered, this result is agreed with the study of Abdullah *et al.*, (2018) who found that mean \pm standard error of vitamin D level of male and female were respectively 16.2 ± 0.2 ng/ml, 13.3 ± 0.5 ng/ml and they related this difference to less sun exposure due to decreased outdoor activities, and to wearing traditional Islamic veils.

3.2 Symptoms of vitamin D deficiency

Table 3.2 showed variations of symptoms among male and female students. The ratio of symptoms appeared respectively in male, female and total were as follow: Hair loss (10% ; 77.5% ; 87.5%), Musculoskeletal pain (2.5% ; 47.5% ; 50%), Tooth problem (7.5% ; 40% ;47.5%), Insomnia (7.5% ; 37.5% ; 45%), Low immunity (2.5% ;30% ;32.5%), Loss of appetite (2.5% ; 25%; 27.5%), Hardness of breathing (2.5%; 22.5% ;25%), Intestinal disorder (2.5% ; 17.5% ; 20%), while other symptoms just appeared in female, vision problem (40%) and melanonychia (2.5%).

Table 3. 2 Distribution and percentage of students according to symptoms of vitamin d deficiency

Symptoms	N0(%) Male	N0(%) Female	N0(%) Total
Hair loss	4 (10%)	31 (77.5%)	35 (87.5%)
Musculoskeletal pain	1 (2.5%)	19 (47.5%)	20 (50%)
Tooth problem	3 (7.5%)	16 (40%)	19 (47.5%)
Insomnia (Sleep disorder)	3 (7.5%)	15 (37.5%)	18 (45%)
Vision problem	0 (0%)	16 (40%)	16 (40%)
Low immunity	1 (2.5%)	12 (30%)	13 (32.5%)
Loss of appetite	1 (2.5%)	10 (25%)	11 (27.5%)
Hardness of breathing	1 (2.5%)	9 (22.5%)	10 (25%)
Intestinal disorder	1 (2.5%)	7 (17.5%)	8 (20%)
(Melanonychia) 	0 (0%)	1 (2.5%)	1 (2.5%)

Hair loss was the most common symptoms appeared among students in female more than male, this result agreed with the study of Yeasmin *et al.*, (2021) who revealed that 28.57% of male have regular hair losing which was less than female 53.85%.

Since octocrylene is used in production of shampoos, hair sprays, tannin oils, and conditioners Abdi, (2022) that is why hair loss was very common symptoms of vitamin D deficiency among our participants. Octocrylene may be easily absorbed into the skin and enhance reactive oxygen species (Hanson *et al.*, 2006).

Our finding about musculoskeletal pain agreed with the study of Ali and Uddin., (2022) who found that 72% of participants have low back pain, 16% have Shoulder pain and 24% have Knee pain.

It is recognized that the vitamin D and the calcium are interdependent. For this reason, the role of vitamin D is very important and sometimes it contributes to the appearance of osteoporosis. Osteoporosis is usually associated with insufficient intake of calcium. Inadequate vitamin D leads to osteoporosis as the absorption of calcium is reduced (Heaney, 2003).

Seshadri and De, (2012) revealed that longitudinal melanonychia of the nail plate associated with vitamin D deficiency. In our investigation we also had noticed symptoms of magnesium deficiency by examination of their nails, since some white spots appeared on them.

Magnesium and vitamin D are two essential nutrients and therefore, their balance is essential for maintaining the physiological functions of various organs (Reddy *et al.*, 2019). Deficiencies in both nutrients are associated with skeletal abnormalities, cardiovascular diseases, and metabolic syndrome. Magnesium is also an important

cofactor needed to activate a variety of enzymes. It seems that all the enzymes that metabolize vitamin D need magnesium for their function. Magnesium also helps synthesis of the active form of vitamin D in the body. It acts as a cofactor in enzymatic reactions for vitamin D activation in the liver and kidneys (Erem, 2019). Magnesium deficiency may be one of the causes behind vitamin D deficiency among the students, so for further study we have to measure magnesium levels beside vitamin D.

3.3 BMI of participants

As showed in table 3.3, most of the students 72.5% include (12.5% male; 60% female) had normal BMI, while 15% include (2.5% male ; 12.5% female) had overweight and 5% were obese include (2.5% male; 2.5% female).

Table 3. 3. Distribution and ratio of students according to BMI

	Normal 18.5-24.9	Over weight 25-29.9	Obese ≥ 30
Male	5 (12.5%)	1 (2.5%)	1 (2.5%)
Female	24 (60%)	5 (12.5%)	1 (2.5%)
Total	29 (72.5%)	6 (15%)	2 (5%)

In fact, mean \pm standard error value of BMI for male was 23.42 ± 1.46 , while in female was 28.09 ± 4.82 at P value 0.05, there was no significant difference between them (Fig. 3.2).

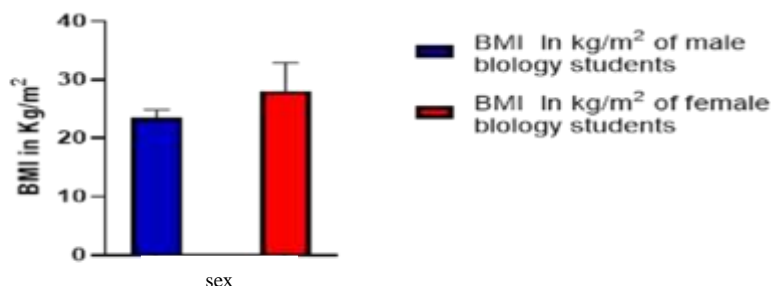


figure 3.2 mean value of BMI in Kg/m² in the third stage biology students /education college- Salahaddin University.

These results agree with the study of Lee *et al.*, (2008) who found that 56.9% of participants had normal BMI, while 12.6% had over weight and 9.8% were obese.

One mechanism believed to have an effect on obesity and low vitamin D level is the decrease in bioavailability. This means increases in body fat and decrease in serum 25(OH)D level (Rock, 2012).

Majority of students had normal BMI and suffered from vitamin D deficiency, so increasing sample size will clarify whether there is any correlation between obesity and vitamin D.

3.4 Life style:

3.4.1 Sun exposure:

Half students 50% including (7.5% male ; 42.5 % female) exposed to sunlight more than 15 minutes /day, quarter of them include (7.5% male ; 17.5% female) exposed to sunlight 15 minutes / day and 25% include (5% male ; 20% female) exposed to sunlight less than 15 minutes / day (Table 3.4).

Table 3.4. Distribution and percentage of students according to daily sun exposure

Daily sun exposure	No. (%)		
	Male	Female	Total
<15 min/d	2 (5%)	8 (20%)	10 (25%)
15 min/d	3 (7.5%)	7 (17.5%)	10 (25%)
>15 min/d	3 (7.5%)	17 (42.5%)	20 (50%)

Many studies report that any exposure of (~20%) the body either direct or indirect, is useful in rising blood concentrations of 25-hydroxyvitamin D3 [25(OH)D3] and vitamin D. The value of vitamin D is measured in international units of biological

action, $1\mu\text{g}$ of vitamin D₃=40 IU. So the recommended sufficient intake for women and men in adulthood is 600IU (Holick, 2004).

3.4.2 Sunscreen usage

Figure 3.3 showed that 37.5% of the participants have used sunscreen include (2.5% male ; 35% female).

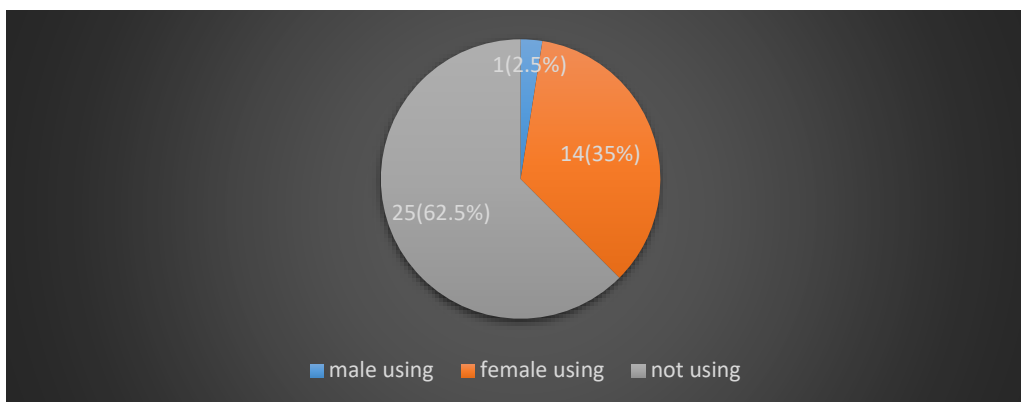


Figure 3.3 Distribution and ratio of students who use sunscreen

Abdi *et al.*, (2022) revealed that incessant exposure to octocrylene may disrupt normal vitamin D synthesis.

Octocrylene is an organic molecule that is exploited as a sunscreen and cosmetic component. It is an ultraviolet (UV) radiation absorber that is oil soluble and water resistant. In addition, octocrylene is very stable, and it may preserve and augment other UV absorbers while enhancing their skin coating uniformity (Egambaram *et al.*, 2020).

3.4.3 Sources of vitamin D

As showed in table 3.5 high ratio of students 97.5% include (20% male; 77.5% female) eat meat regularly every week, followed by 87.5% include (20% male ; 67.5% female) eat egg, while 62.5% include (10% male; 52.5% female) regularly drink milk,

half student include (12.5% male; 37.5% female) consume fish and 15% include (2.5% male ; 12.5% female) take supplement.

In general, there was no such important notes about consumption of meals rich in vitamin D except for fish consumption which is highly costed and taking supplement which related to irregular checking of vitamin D level.

Table 3.5 Distribution and ratio of students who consume meals rich in vitamin D

Food type	regularly consumption (%)		Total (%)
	Male	Female	
Meat	8 (20%)	31 (77.5%)	39 (97.5%)
Egg	8 (20%)	27 (67.5%)	35 (87. 5%)
Milk	4 (10%)	21 (52.5%)	25 (62.5%)
Fish	5 (12.5%)	15 (37.5%)	16 (50%)
Supplement	1 (2.5%)	5 (12.5%)	6 (15%)

Our results somewhat disagree with the study of Lee *et al.*, (2008) who revealed that 17.64% eat meat, 19.7% eat egg, 20.56% drink milk, 97.1% eat fish regularly and 20.6% take supplements.

The deficiency of vitamin D is a result of important reasons. One of them is the nutrient deficiency which is due to the fact that the dietary is not adequate for our organism. This usually happening when its consumption is lower than recommended levels. Moreover, is a common phenomenon that it is noted in diets which are connected with allergy milk, vegetarian's diets and diets intolerant in lactose. The absorption of dietary calcium in small intestine is no more than 10-15%, without vitamin D (Holick, 2004).

In recent years, the consumption of nutrition supplements of vitamin D has become more common. The type of vitamin D which is used in supplements foodstuff can be either vitamin D3 or vitamin D2. In the market of supplements, many of these products contained 400IU per daily dosage but now the levels have increased. (FDA, 2009).

3.4.4 Health status and vitamin D level

Approximately (25%) including (male 2.5% ; female 22.5%) suffered from health disorders like renal problems, hormonal fluctuations and gastric disorders, (Table 3.6).

Table 3.6. Percentage and distribution of students who suffered from health problems

	No. %		
	Male	Female	Total
Health defects	1 (2.5%)	9 (22.5%)	10 (25%)

The kidney plays a central role in vitamin D metabolism and regulation of its circulating levels. Therefore, impaired renal function may lead to vitamin D deficiency, as has been observed in patients with chronic kidney disease (CKD). There seem to be several mechanisms involved in decreased production of 1,25(OH)₂D that occur over the course of CKD progression. A decrease in renal mass limits the amount of 1 α -hydroxylase available for the production of the active vitamin D metabolite (Andress, 2006).

Vitamin D deficiency causes a decrease in the efficiency of intestinal calcium absorption and results in a decrease in ionized calcium. The calcium sensor in the parathyroid glands immediately recognizes the decrease causing the parathyroid glands to increase the production and secretion of parathyroid hormone (PTH) (Holick, 2010).

4-Conclusion

1-Vitamin D deficiency was very common health problem among the students.

2-Serum vitamin D level of the females was lower than the males.

3-Hair lose followed by musculoskeletal pain were the most common symptoms of hypovitaminosis D which appeared among participants.

4-Low sun exposure due to wearing traditional Islamic veils and low awareness about the regular checking of vitamin D level in order to take supplements as well as irregular fish consumption were the most common causes of vitamin D deficiency of participants.

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