The Prevalence of Vitamin D Deficiency: A Comparison Study in Two Libyan Cities Exemplified by Tarhuna and Tripoli

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Abstract:

Vitamin D is a fat soluble vitamin, mostly made from 7 hydroxycholesterol in the skin with the aid of ultraviolet B radiation (UVB). Its function is facilitating the calcium and phosphorus absorption from the intestines that enables them to be transported among others to bones and teeth. In addition, maintaining the blood calcium homeostasis. Its deficiency leads to rickets and osteoporosis. This study aimed to analysis of the vitamin D levels in a randomized samples in the two Libyan cities (Tarhuna & Tripoli) to contribute in the evaluation of the prevalence of vitamin D deficiency in the society. Therefore, vitamin D levels among 106 cases (52 from Tarhuna and 54 from Tripoli) were examined and measured. Results of current study showed that 50 out of 106 cases (47.17%) were deficient in vitamin D, while insufficient vitamin D levels were found in 25 out of 106 cases (23.58%).

Key words: Vitamin D, Rickets.

الملخص

فيتامين (د) هو فيتامين قابل للذوبان في الدهون و يتكون في الغالب من مادة 7 هيدروكسي كولسترول الموجودة بالجلد بمساعدة الأشعة فوق البنفسجية من ضوء الشمس. وظيفته هي تسهيل امتصاص الكالسيوم و الفسفور الموجودان بالغذاء من الأمعاء مما يمكنهما من الانتقال إلى أنسجة أخرى و خاصة العظام و الأسنان، بالإضافة إلي المحافظة على مايسمي بالاتزان لمستوى الكالسيوم في الدم. ونقص فيتامين (د) يؤدي إلى أمراض الكساح و هشاشة العظام. هدفت هذه الدراسة إلى تحليل مستويات فيتامين (د) في عينات عشوائية في المدينتين الليبيتين (ترهونة وطرابلس) للمساهمة في تقييم انتشار نقص فيتامين (د) في المجتمع. وقد أظهرت نتائج الدراسة الحالية أن 50 من أصل 106 حالات (47.17 ٪) كانت تعاني من نقص فيتامين (د)، في حين وجدت مستويات فيتامين (د) غير كافية في 25 حالة من أصل 106 (23.58 ٪).

1. INTRODUCTION

Vitamin D is a fat soluble vitamin. (Melvin J., et al 1982) Vitamin D is considered as a steroid hormone that is continuously made inside the skin by converting inactive 7-dehydrocholesterol "which derived from cholesterol" to cholecalciferol (vitamin D3) with the help of ultra violet B (UVB) rays, and from there it reachs the liver where converts into 25-hydroxyvitamin D3 (calcidiol) then it transfers to the kidneys where becomes 1,25 dihydroxyvitamin D3 known as (calictriol Vitamin D3) which is the active form of vitamin D. Finally, calcitriol goes to intestine to help for calcium and phosphate uptake. (Michael et al., 2007). Healthy liver and kidneys are essential to activate vitamin D inside the human body (Oraby., 2005).

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The primary function of vitamin D is to facilitate calcium and phosphorus absorption across the intestinal wall. Secondly, it has some role in cellular growth, specialization and programmed cell death. There is also an evidence that it stimulates the release of the insulin as well as the modulation of the immune system. In addition, it alleviates the inflammation and contributes in muscle development. (Michael et al., 2007)

The principal source of vitamin D is regular and short periods of the exposure to the UVB rays. (Melvin J et al., 1982) The second source is the diet obtained from oily fish, egg, cod liver oil, meat, mushroom, and fortified dairy products. Breastfed babies get their vitamin D from their mother's breast milk. (Paula et al., 2009)

Deficiency of vitamin D leads to Rickets disease that leads to decreased mineralization of the growth plate in the growing children. (Almutair and Alsubhi., 2017). In adults, the disease is called osteomalacia that is caused by the low levels of calcium and phosphorus in the bone matrix only. (Melvin J., et al 1982). The prevalence of rickets and vitamin D insufficiency is increasing in people of all ages in the developed world, due in part to decreased sunlight exposure and widespread sunscreen usage. (Dittmer and Thompson., 2011) .Worldwide, rickets is the most common form of metabolic bone disease in children. (Sunil et al., 2015)

2. The study aim:

The study aimed to analysis of the vitamin D levels in a randomized samples in the two Libya cities (Tarhuna & Tripoli) to contribute in the evaluation of the prevalence of vitamin d deficiency in the society.

3. Materials and Methods:

This study was conducted on 106 cases (52 from Tarhuna and 54 from Tripoli). 5ml of venous blood were collected under sterile conditions from each individual, then carried to the laboratory where centrifuged at 3000 r.p.m for 5 min to separate the serum. The serum obtained was examined in order to determine the levels of 25-hydroxyvitamin D. The Statistical Package for Social Science version 16 (SPSS), software for biostatic analysis was used to achieve valid and reliable results obtained in this study. P values < 0.05 were considered significant. Data were then presented in tables and figures.

4. Results:

A total of 106 samples were examined in order to determine the level of 25-hydroxyvitamin D in the blood serum, the results showed that 23 out of 106 samples were having a normal level of vitamin D (25-100 ng/ml) which represent a rate of 21.70% of cases from both Tarhuna and Tripoli patients by using the routine technique. Also, a sum of 32 out of 106 samples were having an insufficient amount of vitamin D (12-20 ng/ml) in their blood serum which represent a rate of 30.19% from both cities cases. Eventually, 51 out of 106 were deficient of vitamin D (<12 ng/ml) by using the same technique with a percentage of 48.11% of the total cases from both laboratories.

The results revealed that the three groups showing different symptoms like skeletal muscle cramping, fatigue……etc.

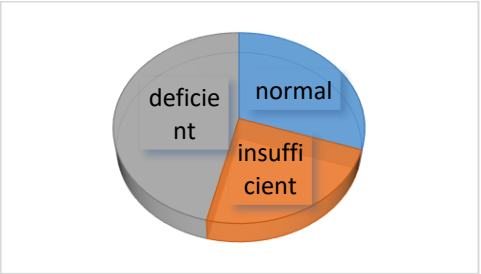

Fig.1. represents the total cases (normal, insufficient and deficient) in both labs.

Differences between Tarhuna and Tripoli Patients:

The results indicated that 9 out of 52 cases from Tarhuna were having normal levels of serum vitamin D which represents 17.30% of the studied patients in comparison to Tripoli normal levels of 22 out of 54 that represents 40.74%. In addition, the insufficient level of vitamin D was 13 out of 52 (25%) and 12 out of 54 (22.22%) for Tarhuna and Tripoli respectively. Lastly, the patients who were deficient in vitamin D in both groups as follow 30 out of 52 (57.70%) and 20 out of 54 (37.04%), this results was statistically significant (P = 0.07).

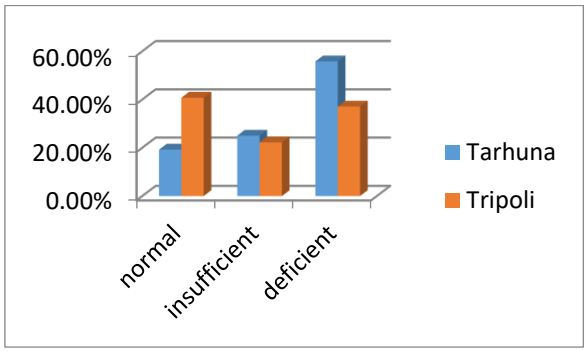

Fig.2. shows the value (%) differences between Tarhuna and Tripoli patients

Prevalence of vitamin D deficiency according to the age group:

As can be seen from table 1 & table 2, the cases were divided into five age groups of fifteen years interval irrespective of the gender in both laboratories. In the first age group (1-15 years old), there were 4 out of 9 and 3 out of 9 cases recorded as deficient from Tarhuna and Tripoli respectively. In the second age group (16-30 years old), there were 6 out of 9 and 7 out of 11 recorded cases as deficient.

The third age group (31-45 years old), the recorded cases as deficient were 7 out of 13 and 5 out of 11. The fourth age group (46-60 years old), the deficient recorded cases were 10 out of 14 and 4 out of 16.

The last age group (61-70 years old), vitamin D deficiency was 3 out of 7 and 1 out of 7, (no statistically significant in these results, P = 0.36).

Table 1. Results taken from Tarhuna (Alzahra) lab according to the age group.

Age group	Normal (25 –100 ng/ml)	Insufficient (12-20 ng/ml)	Deficiency (<12 ng/ml)	Total
1-15	1	4	4	9
16-30	1	2	6	9
31-45	4	2	7	13
46-60	2	2	10	14
61-75	1	3	3	7
Total	9	13	30	52

Table 2. Results taken from Tripoli (Qurtoba) lab according to the age group.

Age	Normal (25-100 ng/ml)	Insufficiency (12-20 ng/ml)	Deficiency (<12 ng/ml)	Total

1-15	**4**	**2**	**3**	**9**
16-30	**1**	**3**	**7**	**11**
31-45	**4**	**2**	**5**	**11**
46-60	**9**	**3**	**4**	**16**
61-75	**4**	**2**	**1**	**7**
Total	**22**	**12**	**20**	**54**

The gender distribution of vitamin D deficiency:

The total males of this study were 40 out of 106 (37.74%), and the total females were 66 out of 106 (62.26%).

In males, the values were recorded for 11 (27.50%), 14 (35%) and 15 out of 40 (37.50%) for normal, insufficient and deficient respectively. However, in females the values recorded as follow 20 (30.30%), 11 (16.67) and 35 (53.03%) out of 66 for normal, insufficient and deficient in order, as the table 3 & table 4 refer to.

Table 3. Shows the ratio between males and females in Tarhuna (Alzahra) lab.

Sex	Normal (25–100 ng/ml)	Insufficiency (12-20 ng/ml)	Deficiency (<12 ng/ml)	Total
Male	**4**	**5**	**11**	**20**
Female	**5**	**8**	**19**	**32**
Total	**9**	**13**	**30**	**52**

Table 4. Shows the ratio between males and females in Tripoli (Qurtoba) lab.

Sex	Normal (25–100 ng/ml)	Insufficiency (12-20 ng/ml)	Deficiency (<12 ng/ml)	Total
Male	**7**	**9**	**4**	**20**
Female	**15**	**3**	**16**	**34**
Total	**22**	**12**	**20**	**54**

Discussion:

This study gave some information about the prevalence of vitamin D deficiency provided by two important laboratories that are located in two different Libyan cities exemplified by the capital city Tripoli and the nearby city of Tarhuna, both are located in the western region of Libya with similar climate and social habits including food dishes. The samples were not targeting specific population, but randomly assessed in a specific period of time that was between April and September 2019.The direct blood samples were collected from 106 patients who were attending the both labs accompanied by test letter from their doctors. The technique had being used has a high sensitivity and accuracy and widely used in Libya in diagnosis of vitamin d deficiency.

The overall results of this study found that 50 cases out of 106 were vitamin D deficient that represents a rate of 47.17% of both labs. However, in accordance with the gender, the study showed 35 out of the 50 deficient cases were females that represents 70% of the deficient cases. This percentage indicates that women far more vulnerable than men to hypovitaminosis D. In relation

to age group (46-60 years old) recorded the highest rate in particular from Tarhuna area.

Generally, out of the 50 deficient cases, 30 deficient cases were recorded from Tarhuna area which represents 60%, and the Tripoli area represents 40%.

These findings appear to be in accordance with the high rates of vitamin D deficiency which reported by most of the previous studies e.g. **Elsammak *et al*., 2011** in Saudi Arabia, showed that (87 males & 52 females) among 139 volunteers had a marked deficiency of 25-OH vitamin D in both sexes, despite the fact that more than 65% of volunteers mentioned that they normally have enough sun exposure and more than 90% consume enough dairy products. This suggests a genetic or a racial cause of hypovitaminosis D. In an Australian review, it says vitamin D deficiency is common in Australia, even though the abundance of the sunshine. This suggests that vitamin D deficiency is multi-factorial (**Devina *et al*., 2010**). One article from Singapore showed a vitamin D deficiency prevalence of 57.5% and vitamin D insufficiency of 34.5% in elderly patients who were hospitalized with hip fractures. (**Linsey *et al*., 2015)**

In an updated article from Brazil stated that severe vitamin D deficiency leading to rickets or osteomalacia is rare in Brazil, but there is an accumulating evidence of the frequent occurrence of subclinical vitamin D deficiency especially in the elderly. (**Francisco *et al*., 2006**)

Conclusion:

In the present study, vitamin D deficiency is quite prevalent in these two areas especially in Tarhuna area. This suggests that life style and nutrition may be more favorable in Tripoli.

In relation to the gender, clearly women are more affected than men. This indicates the hormonal status and the role of estrogen in women. Another notice was the age group 46-60 years old which is the menopausal period, this is compatible with the role of hormonal changes and its connection with vitamin d deficiency.

Finally, vitamin D deficiency started to take awareness between the public as people

looking for healthy life style among each other.

Recommendations:

There are some recommendations for further studies and more need to controlled and organized research to detect the real causes of the deficiency. In this regard, many deficient cases are symptomless and when calcium level is measured, it well be normal. The another recommendation is to find more about the relationship between vitamin D deficiency and the different diseases other than rickets and osteomalacia, for example: cancer, cardiovascular diseases, diabetes, etc, because vitamin D has receptors in almost all body cells, so it is definitely has a sort of relationship to all of them.

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