Prevalence of Vitamin D Deficiency and its Status Change in Managed cases in Ajdabyia City-Libya

Tarek A. Abdulkareem

College of Medical Technology- Benghazi

الملخص:

الخلفية/ الهدف: فيتامين (د) هو الاسم الجامع للكولي كالسيفيرول (فيتامين د3) وإرغوكالسيفيرول (فيتامين د2)، وهما سلائف لهرمونات ذات دور مهم في تنظيم عملية التمثيل الغذائي للكالسيوم والفوسفات. لذلك فهو ضروري للحفاظ على صحة العظام. تهدف هذه الدراسة إلى تحديد مدى انتشار نقص فيتامين (د) فيما يتعلق بالجنس والعمر، وتأثير مكملات فيتامين (د) على حالة الفيتامين. **المواد والطرق:** تم جمع نتائج اختبار فيتامين (د) من 7 عيادات في مدينة اجدابيا - ليبيا. حيث قام الأطباء بملء استبيان لمرضاهم و أجري تحليل فيتامين (د) في أوقات مختلفة. تم تحليل البيانات باستخدام برامج الكمبيوتر (SPSS، الإصدار 16). **النتائج:** من بين 122 حالة شملتها الدراسة 54.1٪ كانت لديهم معدلات فيتامين د ضمن المعدل الطبيعي، 23.8٪ كانوا غير مكتفين، و 22.1٪ كانوا يعانون نقصًا بعد العلاج، بينما قبل العلاج كان 18٪ من الأشخاص لديهم معدلات فيتامين د طبيعية. 36٪ من الأشخاص انتقلوا إلى حالة اكتفاء بعد العلاج والمتابعة. أظهر 26.9٪ من الذكور مستويات فيتامين (د) أقل من القيم الطبيعية عند تحليل فيتامين (د) بعد المتابعة ، بينما أظهر 51٪ من الإناث مستويات فيتامين (د) أقل بعد المتابعة. **الخلاصة:** خلصت الدراسة إلى أن انتشار نقص فيتامين (د) مرتفع نسبيًا ويمكن تصحيح و معالجة هذا النقص لدى عدد كبير من الحالات لأن العلاج بفيتامين د 3 يحسن حالة فيتامين (د) ويزيد تركيزه عند أولئك الذين يعانون من نقص فيتامين (د)

الكلمات المفتاحية: الانتشار ، فيتامين د ، نقص ، مكمل ، حالة.

ABSTRACT:

Background/aim: Vitamin D refers to the precursors of hormones cholecalciferol (vitamin D3) and ergocalciferol (vitamin D2), which play a

significant role in the regulation of calcium and phosphate metabolism. As a result, it's critical for maintaining bone. The study aims to know how common vitamin D deficiency is by sex and age, as well as what influence vitamin D supplementation has on vitamin status. **Materials and procedures:** The results of vitamin D tests were obtained from seven clinics in the Libyan city of Ajdabyia. Physicians completed a questionnaire for their patients who requested vitamin D testing at various periods throughout the study period. Computer software was used to analyze the data (SPSS, Version 16.0, Chicago, IL). **Results:** Of the 122 cases studied, 54.1 percent had enough Vit D levels, 23.8 percent had insufficient levels, and 22.1 percent were deficient after therapy, while 18 percent had adequate levels before treatment. After therapy and follow-up, 36% of the individuals were in a sufficient state. 26.9% of males showed vitamin D levels lower than normal values when analyzed for vitamin D after follow up, while 51% of females showed vitamin D levels lower values after follow up. **Conclusion:** The study concludes that vitamin D deficiency is rather common and that it can be corrected in a considerable percentage of cases by taking a vitamin D3 supplement, which improves vitamin D status and increases 1,25-(OH)2D concentrations in patients who are vitamin D deficient.

Key words: Prevalence, vitamin D, deficiency, supplement, status.

INTRODUCTION:

Vitamin D is a nutrient, but can also be synthesised in the human skin by sunlight exposure. The primary functions of vitamin D is the regulation of calcium and phosphate metabolism, therefore it is it is fundamental for the support of bone wellbeing. If not supplied in adequate amounts during childhood, rickets and osteomalacia will develop (Braegger et al., 2013).

"Unlike other vitamins, there is no need to obtain vitamin D from food. A main source of vitamin D is made by our own bodies. It is made in the skin by the action of sunlight. This is a good thing because most foods contain no or very little vitamin D naturally" (NICE public health guidance, 2014).

Vitamin D has advanced into a hormone that's active all through the body not as it were to control calcium and bone digestion system but also to diminish the hazard of constant illnesses as autoimmune, malignant, cardiovascular and infectious diseases. (Balasubramanian et al., 2013)

Vitamin D deficiency is now diagnosed as a pandemic. The main reason of is the lack of awareness that moderate exposure to the sun is the main source of vitamin D for most people. (Holick & Chen, 2008)

Bordelon and his colleagues outlined the vitamin deficiency as a serum level of 25-hydroxyvitamin D < 20 ng per mL or 50 nmol/L, and insufficiency is defined as a serum level of 25-hydroxyvitamin D of 20 - 30 ng per mL or 50 to 75 nmol/L. They mentioned common manifestations of vitamin D deficiency are regular low back pain, proximal muscle weakness, muscle aches, and throbbing bone pain evoked with pressure over the breastbone or tibia. (Bordelon et al., 2009)

In the past decade, more attention has been paid to the benefits of vitamin D for bone health and possibly other diseases. Vitamin D measuring has exponentially increased in recent years. (Crowe et al., 2019)

Re-examination of optimal serum levels and multiple reports regarding high rates of vitamin D insufficiency and deficiency resulted in revised recommendations for minimum vitamin D intake and new guidelines for treatment with high vitamin D doses. (Vogiatzi et al., 2019)

Vitamin D testing and the utilize of vitamin D supplements have expanded significantly in later a long time. Vitamin D testing and treatment may be a subject of disputable logical talks , with mostly contradicted suppositions and suggestions. Deficiency of vitamin D can be caused by a variety of health conditions, but studies on the effects of vitamin D supplements have had mixed results. (Pilz et al., 2019). This study tries to access the level of this deficiency and the effect of treatment in reversing this condition.

OBJECTIVE OF THE STUDY:

The aim of this study was to determine the prevalence of vitamin D deficiency in people of different sexes and ages who attended the clinics included in the study and requested a vitamin D analysis, and to determine their vitamin D status according to the Assess treatment and follow-up care.

MATERIALS AND METHODS:

This is a retrospective study of a continuously-enrolled patient p This is a retrospective study of a patient population that was continuously enrolled from October 2016 to December 2016 to investigate the effects of vitamin D testing

on future vitamin status. This study identified 122 patients who had another 25 (OH) D test during this time after the first.

Study population and area: Subjects of different age and sex were randomly selected from Shohada Ajdabyia Health Centre, Al Dorra Clinic, Al Basateen Clinic, Al Madina Clinic, Al Afia Clinic, Al Zaitouna Clinic, Al Hekma Clinic. Information were obtained from patients attended to various specialties departments and asked for Vitamin D measurement

Data collection: Physicians filled a questionnaire for their patients whom requested for vitamin D analysis, results were reported at different times. Questionnaire is administrated to assess information about name, age ,sex, nationality, history, and vitamin D results of patients.

Statistical analysis: Data analysis was carried out with computer software (SPSS, Version 16.0, SPSS Inc., Chicago, IL). Frequencies, percentages were computed and the comparison was made by Chi squire analysis to examine significant relationship between different variables in the data. Statistical significance was taken at a p value of less than 0.05.

RESULTS:

In this retrospective study, 122 blood samples were collected and analyzed for the level of vitamin D, 26 case of them were males (21.3%), and 96 were females (78.7%).

Different ages were included in the study, Age of participants in this study ranged from 1 year to 83 years old (mean age 42). Subjects were divided into six age groups as follows: 1-15, 16-30, 31-45, 46-60, 61-75, and 76-90. Frequencies of those age groups is explained in the following chart, where the age group 1-15 represented 18% (22 subjects), the age group 16-30 represented 36.9% (45 subjects), the age group 31-45 represented 19.7% (24 subjects), the age group 46-60 represented 16.4% (20 subjects), the age group 61-75 represented 8.2% (10 subjects), and the age group 76-90 represented 8% (only 1 subject).

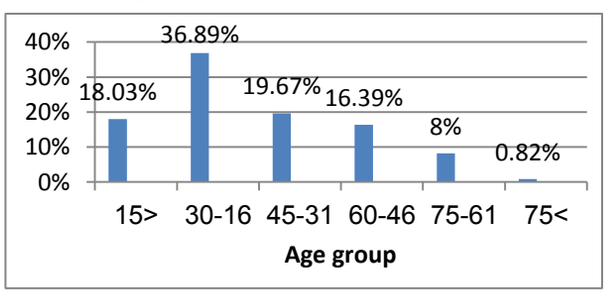

Figure 1. Distribution age groups included in the study.

Cases included in the study were from different departments in different clinics as mentioned in this study. Table.1 explains those specialties.

Table 1. Distribution of cases according to department

Department	Frequency	Percent
Medicine	38	1.1
Orthopedic	18	14.8
Nutrition	9	7.4
Dermatology	16	13.1
Neurology	6	.9
Paediatric	17	13.9
Gyneacology	18	14.8
Total	122	100.0

The patients samples after two measurements (who had done another Vit. D test) exhibited the following results:

- 54.1% (66 subject) were sufficient

- 23.8% (29 subject) were insufficient (serum 25-hydroxyvitamin D level 20 to 30 ng per mL)

- 22.1% (27 subject) were deficient (serum 25-hydroxyvitamin D level of less than 20 ng per mL)

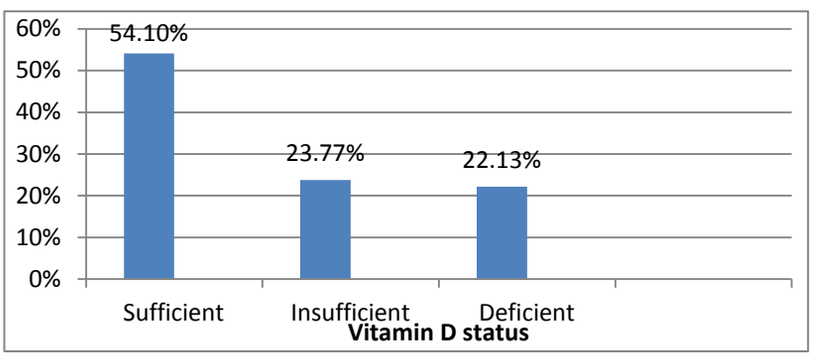

Figure 2. Vitamin D status of members included in the study following treatment.

Regarding the early evaluation of vitamin D for subjects included in the study, the findings were:

- 22 (18%) subjects had normal vitamin D values.

- 44 (36%) of subjects within the normal range after treatment and follow up.

- vitamin levels were below the normal values before and after treatment, the number of subjects 56 (46%) subjects

Table 2. Age VS previous Vit. D test

Age group	Previous level of Vit. D			Total
	Normal	Insufficient	Deficient	
1-15	10	0	12	22
16-30	3	4	38	45
31-45	3	2	19	24
46-60	2	1	17	20
61-75	3	2	5	10
76-90	1	0	0	1
Total	22	9	91	122

Subjects when analyzed for vitamin D before management, they exhibited the following:

- 1-15 y (12 persons, 55%) showed vitamin D levels lower than normal values
- 16-30 y (42 persons, 93%) showed vitamin D levels lower than normal values
- 31-45 y (21 persons, 87%) showed vitamin D levels lower than normal values
- 46-60 y (18 persons, 90%) showed vitamin D levels lower than normal values
- 61-75 y (7persons, 70%) showed vitamin D levels lower than normal values
- 76-90 y, only one case which did not show abnormal values

Table 3 . Age VS recent Vit. D test

	Last analysis level of Vit. D			Total
	Normal	Insufficient	Deficient	
1-15	14	5	3	22
16-30	21	10	14	45
31-45	10	7	7	24
46-60	13	6	1	20

	61-75	7	1	2	10
	76-90	1	0	0	1
Total		66	29	27	122

Subjects when analyzed for vitamin D after treatment, they exhibited the following:

- Subjects aged 1-15 (8 persons, 37%) showed vitamin D levels lower than normal values

- Subjects aged 16-30 (24 persons, 53%) showed vitamin D levels lower than normal values

- Subjects aged 31-45 (14 persons, 58%) showed vitamin D levels lower than normal values

- Subjects aged 46-60 (7 persons, 35%) showed vitamin D levels lower than normal values

- Subjects aged 61-75, (3 persons, 30%) showed vitamin D levels lower than normal values

- Subjects aged 76-90, only one case which did not show abnormal values

Table 4. Sex VS previous Vit. D test

Sex	Previous level of Vit. D			Total
	Normal	Insufficient	Deficient	
Male	13	2	11	26
Female	9	7	80	96
Total	22	9	91	122

- 50% of males showed vitamin D levels lower than normal values when analyzed for vitamin D in previous time

- 96.6% of females showed vitamin D levels lower than normal values when analyzed for vitamin D in previous time

Table 5. Sex VS recent Vit. D test

	Last analysis level of Vit. D			Total
	Normal	Insufficient	Deficient	
SMale	19	5	2	26
Female	47	24	25	96
T	66	29	27	122

- 26.9% of males showed vitamin D levels lower than normal values when analyzed for vitamin D after follow up

- 51% of females showed vitamin D levels lower than normal values when analyzed for vitamin D after follow up

Table 6. Vitamin D status of cases at time attending to different departments

Department	Previous level of Vit. D			Total
	Normal	Insufficient	Deficient	
Medicine	5	5	28	38
Orthopedic	3	1	14	18
Nutrition	1	0	8	9
Dermatology	0	1	15	16
Neurology	2	1	3	6
Paediatric	10	0	7	17
Gyneacology	1	1	16	18
Total	22	9	91	122

Regarding the patients complaining of low vitamin D levels in the various specialties attending to the clinics included in the study, was as following:

- Medicine department: 86% (5 insufficient+28 deficient)

- Orthopedic department: 83% (1 insufficient+14 deficient)

- Nutrition department: 88% (0 insufficient+8 deficient)

- Dermatology department: 100% (1 insufficient+15 deficient)

- Neurology department: 66% (1 insufficient+3 deficient)

- Paediatric department: 41% (0 insufficient+7 deficient)

- Gyneacology department: 94% (1 insufficient+16 deficient)

DISCUSSION:

Vitamin D deficiency is one of the most preventable challenges worldwide **(Rajebi H. et al, 2016)**

The initial results of vitamin D levels showed that 82% of study samples had suffered vitamin deficiency. This percentage was declined in the study population to 46% as they were undergone to vitamin D treatment and followed by their physicians. This means roughly half of subjects who had complained vitamin D deficiency exhibited an improvement and achieved concentrations above the deficiency level.

Vitamin D deficiency incidence has been reported to range from

26% to 82% according to Yan-Peng Zhang and his colleagues , our results were within this range the percentage was initially meet the higher border of this percentage and lowered to less than 26% as cases followed and undergone treatment programme **(Zhang YP et al, 2016)**

Vitamin D deficiency has pandemic proportions around the world. Many studies report a high prevalence of vitamin D deficiency in sunny regions such as the Near East and North Africa. Previous studies have indicated that the Libyan population is at risk of vitamin D deficiency **(Faid et al 2018)**.

A study in the central region in Libya showed a suboptimal rate of Vit. D in 63 % (133/211), this percentage is lower than that of the present study which is 81% (100/122), that improved later to 45.9% (56/122). **(Aisha Nasef et al, 2020)**

~40% of Europeans are vitamin D deficient and this value is slightly lower than our findings in the current study **(Amrein, K. et al., 2013)**

While Majority of Saudi males (76.1%) had vitamin D deficiency, 50% of Libyan males in this study showed vitamin D levels lower than normal values

(Farhat, K.H. et al., 2019). On the other hand in the current study females suffered vitamin D deficiency more than males 96.6%, 50% respectively, as Libyan women are at high risk of vitamin D deficiency, mostly due to their lifestyle and low exposure to sun **(Vidovic N. et al, 2019),** this finding agree with a study in Tripoli that found approximately 87.7% of female patients included in the study had serum Vitamin D concentrations below normal. **(Al-Graiw Manal et al, 2020)**

About third of cases was followed Medicine clinics, followed by Orthopedic, and Gynecology, 18% for each.

The age groups registered higher deficiency rates of vitamin D were 16-30, 46-60 (84%, 85% respectively), other groups ranged from 42% to 54%. All age groups showed an improvement in vitamin D levels, where 36% of cases who suffered a different degrees of deficiency has exhibited levels within normal limits, as an example the percentage declined from 84% to 31% in age from 16-30, and from 42% to 29% in age from 31-45.

In the current study females suffered vitamin D deficiency more than males 96.6%, 42.3% respectively.

However in later evaluation both exhibited a decline in the vitamin deficiency percentages after follow up to 26%, 7% respectively.

Based on the two test results, after a managed care only 222 out of 1127 sufferers (19.7%) improved to be vitamin D sufficient, in comparison to the current Libyan study, the improvement percentage was higher as 44 out of 100 (44%) cases who had suffered either insufficiency or deficiency improved and classified as sufficient. **(Wei M, et al, 2014)**

CONCLUSION:

Vitamin D deficiency and insufficiency pose major public health concern in Libyan society, The study concludes that the prevalence of vitamin D deficiency is comparatively high and may be reversed in significant variety of cases as vitamin D3 supplement improves vitamin D standing and will increases 1,25-(OH)2D concentrations in people with vitamin D deficiency.

REFERENCES:

- Aisha Nasef , Mabrouk Hassan , Adel El- Taguri and Aisha Ali Nagi. (2020). Assessment of vitamin D intake among Libyan women – adaptation and validation

of specific food frequency questionnaire. *International Journal of Advanced Research.* 8(5) 988-994

- Al-Graiw Manal Hassan, Draid Marwan Mustafa, Zaidi Aisha Muftah, Al-Griw Huda Hassan. **(**2020**).** Serum Vitamin D levels and associated risk factors among libyan females living in Tripoli, Libya: A cross-sectional study. *Libyan J Med*. 4(4) 169-173

- Amrein, K., Scherkl, M., Hoffmann, M., Stefan Neuwersch-Sommeregger, Markus Köstenberger, Adelina Tmava Berisha, Gennaro Martucci, Stefan Pilz & Oliver Malle. et al. (2020). Vitamin D deficiency 2.0: an update on the current status worldwide. *Eur J Clin Nutr.* 74, 1498–1513

- Balasubramanian S, Dhanalakshmi K, Amperayani S. (2013). Vitamin D deficiency in childhood-a review of current guidelines on diagnosis and management. *Indian Pediatr.* 50(7). 669-75.

- Bordelon P, Ghetu MV, Langan RC. (2009). Recognition and management of vitamin D deficiency. *Am Fam Physician*. 80(8). 841-6

- Braegger C, Campoy C, Colomb V, Decsi T, Domellof M, Fewtrell M, Hojsak I, Mihatsch W, Molgaard C, Shamir R, Turck D, van Goudoever J (2013). ESPGHAN Committee on Nutrition. Vitamin D in the healthy European paediatric population. *J Pediatr Gastroenterol Nutr*. 56(6). 692-701.

- Crowe FL, Jolly K, MacArthur C, Manaseki-Holland S, Gittoes N, Hewison M, Scragg R, Nirantharakumar K. (2019). Trends in the incidence of testing for vitamin D deficiency in primary care in the UK: a retrospective analysis of The Health Improvement Network (THIN), 2005-2015. *BMJ* Open. 9(6):e028355.

- Faid F, Nikolic M, Milesevic J, Zekovic M, Kadvan A, Gurinovic M, Glibetic M. (2018). Assessment of vitamin D intake among Libyan women - adaptation and validation of specific food frequency questionnaire. *Libyan J Med*. 13(1).

- Farhat, K.H., Arafa, M.A., Rabah, D.M., Amin H.S., Ibrahim N.K. (2019). Vitamin D status and its correlates in Saudi male population. *BMC Public Health* 19, 211

- Holick MF, Chen TC. (2008). Vitamin D deficiency: a worldwide problem with health consequences. *Am J Clin Nutr*. 87(4):1.

- Holick M.F. (2017). The Vitamin D Deficiency Pandemic: Approaches for Diagnosis, Treatment and Prevention. *Rev. Endocr. Metab. Disord.*;18:153–165

- National Institute for Health and Care Excellence. (2014). Vitamin D: increasing supplement use among at-risk groups [Internet]. London (GB): The Institute; Nov,. (NICE public health guidance 56).

- Rajebi H, Khodadad A, Fahimi G, Abolhassani H. (2016). Vitamin D Deficiency among Female Nurses of Children's Medical Center Hospital and Its Related Factors. *Acta Med Iran*. 54(2).146-50.

- Pilz S, Zittermann A, Trummer C, Theiler-Schwetz V, Lerchbaum E, Keppel MH, Grübler MR, März W, Pandis M. (2019). Vitamin D testing and treatment: a narrative review of current evidence. *Endocr Connect*. 8(2): 27-43.

- Vidovic N, Faid F, Pantovic A, Nikolic M, Debeljak-Martacic J, Zekovic M, Milesevic J, Drah MM, Zec M. (2019). Vitamin D and cardio-metabolic biomarkers: small-scale comparative study between Libyan migrants and resident women in Serbia. Libyan J Med. 4(1):1622364.

- Vogiatzi MG, Jacobson-Dickman E, DeBoer MD. (2014). Drugs, and Therapeutics Committee of The Pediatric Endocrine Society. Vitamin D supplementation and risk of toxicity in pediatrics: a review of current literature. *J Clin Endocrinol Metab*. 99(4):1132-41.

- Wei M, Yu R, Deutsch SC. (2014). Insignificant medium-term vitamin D status change after 25-hydroxyvitamin D testing in a large managed care population. PLoS One. 9(8): e105571.

- Zhang YP, Wan YD, Sun TW, Kan QC, Wang LX. (2014). Association between vitamin D deficiency and mortality in critically ill adult patients: a meta-analysis of cohort studies. *Crit Care*. 18(6). 684.