PREVALENCE OF VITAMIN D DEFICIENCY IN CENTRAL REGION OF LIBYA

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Introduction:
Vitamin D deficiency becoming one of the most prevalent health problems worldwide. Sunny countries are not an exception.

Objective: To study the prevalence and epidemiological characters of Vitamin D (Vit D) deficiency in middle region of Libya in two selected cities.

Methods: Retrospective study of patients attended clinics in Benwalied and sirte cities and have been investigated for Vit D status, done by a questioner designed to reveal the possible underlying factors, along Measurements of total 25 hydroxycholecalceferol 25(OH)D3, by using Fluorescence immunoassay. Statistical analysis was reached by using SPSS.

Result: Our result showed sub optimal Vit D level in 63 % (133/211) patient was sub optimal in 63 % (133/211). Among 133 Patients with suboptimal vita D, 70.68 % have deficiency and 29.32 patients have insufficiency. Using aBeing a female, is a risk factor. Sun exposure in light cloths for more than 30 minutes along with consumption of Omega-3, Total 25 Hydroxycholecalceferol could contribute to prevention from Vit D deficiency. Multi-varient analysis showed that use of small quantity of sunscreen is not associated with Vit-D deficiency.

Discussion and Conclusion: Consumption of Omega-3 is advisable as one of preventive measures of Vit D deficiency, however, a more focus and further studies are needed for elucidation of all participant positive and negative factors.
Vitamin D adequacy is best determined by measurements of the 25-hydroxyvitamin D in the blood (3). In this paper we will study the prevalence and epidemiological factors of Vitamin D deficiency through assessment of social and dietary practice, and to define possible underlying causes in affected population in central region of Libya as Phase-I of study of Vitamin D status assessment in Libyans as a component of Project of Health, Nutritional and Environmental Status Assessment (PHNESIA).

Materials and Methods:
A retrospective study has been done for all patients with different age groups attending the clinic (Al Rahma clinical) in Benwailed city and (Noor yaqenclinical) in Sirte, for general health checkup or for complaint and have been investigated for Vitamin D status in the period (August 2018 Month to January Month 2019).

Our work concerned with measurement of total 25 hydroxycholecalciferol, 25(OH)D3 by using Fluorescence immunoassay (IFA) techniques using I Chroma, or Vidas or Tosho analyzers, along with data collection done through questioner designed to elucidate the epidemiological and possible underlying causes of Vitamin D deficiency. Vitamin D levels less than 50 nmol/L are suboptimal for skeletal health. Optimal, sufficient, deficiency (sever and moderate) and toxic level are summarized in agreement with toMayo medical laboratories ranges and following references (4), (5). See Table 1.

| Vitamin D Toxic | > 200 nmol/L, > 80 ng/mL |
| Vitamin D Sufficient | > 50 nmol/L, (>20 ng/mL |
| Vitamin D Optimal | 50-63 nmol/L, 20-25 ng/mL |
| Vitamin D Deficient | < 50 nmol/L, < 20 ng/mL |
| Vitamin D mild to moderate Deficieny | 25-48 nmol/L 10-19 ng/mL |
| Vitamin D Sever Deficieny | < 25 nmol/L, <10 ng/mL |

Data entry has been done by Excel. Statistical analysis of data has been done by using statistical Backage of Social Science (SPSS) version 10. Chi square and Odds Ratio (95%) confidence interval both had been used. Chi square is considered significant if P Value < 0.5. Logistic regression analysis was used to determine the predictors of potential riskfactors.

Evaluation of assessment accuracy:
All technicians are trained (100%), either by qualified trainer or by trained colleagues (52.1%). However quality of training could not be evaluated.

Vitamin D assays done by Fluorescence immunoassay (IFA) by using automated machines Vidas, or i-CHROMA (Boditech Med Inc.’s) or Tosho (Bioscience, Inc). Despite use of quality control materials provided in kits from companies’ suppliers, there are no established quality control and quality assurance programs at national laboratories.

Results:
Attributes and distribution of sample according to different factors associated with Vitamin D deficiency:

One hundred patients of the total 211 were from Benewalid and 110 from Sirt.

There was predominance of females either in Sirt or in Benewalid. Age categories for 211 patients were; Children (26/ 12.3% ), Adolescents (20/ 9.5 %), Young adults (24/ 11.4 %), adults (89/ 42.2 % ), Late adults (52/ 24.6 % ). Result of analysis of different factors associated with Vitamin D deficiency in total study population (TSP) are listed in Table-2

| Factor         | Patients Number and Percentage.          |
|----------------|-----------------------------------------|
| Gender         | Female: 133/211 (63.0 %), two were pregnant. Male: 78/211 (37%). |
| Ethnicity      | Non Blacks: 206/211 (97.6 %). |
Vitamin D deficiency percentage and category:
Vitamin D level was sub optimal in 63 % (133/211) patient, while 37.0 % (78 /211) of patients have optimal vitamin D level. Then we categorized patients with sub optimal vitamin D (133/211) in to two categories. Patients with vitamin D deficiency (94/113 ) represent 70.68 % and patients with insufficiency (39/133 ) represent 29.32 %. see Figure-1. Considering TSP (211), patients with with vitamin D deficiency (94/211) represent 44.5 % and patients with insufficiency (39/211 as TSP ) represent 18.5%.

![Figure 1: Percentage of Vitamin D deficiency and Vitamin D insufficiency in patients with sub optimal vitamin D level.](image-url)
Proportion of Vitamin D deficiency according to age and gender:
Table 3 illustrated distribution of Vitamin D deficiency among different groups.

Table 3:- The percentage of Vitamin D deficiency among different groups.

| Age Group  | Number (Percentage) | Group Number of Male - Female | Group Number of Normal Vitaim D Male - Female | Group Number of Vitaim D deficient Male - Female |
|------------|---------------------|------------------------------|---------------------------------------------|-----------------------------------------------|
| Children   | 26 (12.3%)          | 9-17                         | 2-1                                        | 7-16                                         |
| Adolescents| 20 (9.5 %)          | 7-13                         | 1-2                                        | 6-11                                         |
| Young adults| 24 (11.4 %)       | 9-15                         | 4-2                                        | 5-13                                         |
| Adults     | 89 (42.2 %)         | 31-58                        | 22-19                                      | 9-39                                         |
| Late adults| 2 (24.6 %)          | 22-30                        | 16-9                                      | 6-21                                         |

Our results showed that overall proportion of vitamin D deficiency is higher in Younger age. There is a difference in proportion of vitamin D deficiency between male and female. Female are deficient in all age groups, but difference increase with increasing age, where females represent more than two thirds in adult and late adult groups. Distribution of proportion of Vitamin D deficient population according to age and gender. Are shown in Figure 2.

Contribution of determent and related factors in Vitamin D deficiency:
Using of univariate analysis showed that female are more susceptible to Vitamin D deficiency. Muscular pain and warm extremities symptoms were statistically significant in Patients with Vitamin D deficiency.

Our study showed that use of sun screen was found in half of patients with Vitamin D deficiency. And about two third of Patients who did not consume dairy products have Vitamin D deficiency. However, consumption of Omega-3 could contribute to prevention from vitamin D deficiency, as 14.2 % of patients without Vitamin D deficiency consume it. Sun exposure in light cloths and for more than 30 minutes play an preventive role for Vitamin D deficiency. see Table 4.

Using multivariate analysis to study association between risk factors and presence of vitamin D deficiency showed that being a female and lack of sun exposure in light cloths are risk factors for Vitamin D deficiency. And consumption of Omeg-3/col oil is a preventative factor. See Table 5.
Table 4: Determent and related factors:

| Factors                        | Number among deficient /133 | Number among non-deficient/78 | Odds ratio (Confidence interval) | P Value |
|--------------------------------|----------------------------|-------------------------------|----------------------------------|---------|
| Gender/Being a Female          | 100                        | 33                            | 1.777 (1.347-0.234)             | <0.001  |
| Tanning                        | 31                         | 24                            | 0.765 (0.481-1.192)             | 0.15    |
| Sun Exposure Light Clothes     | 47                         | 54                            | 0.510 (0.388-0.671)             | <0.001  |
| Sun Exposure > 30 Minutes in Last Week | 47               | 54                            | 0.510 (0.39-0.67)               | <0.001  |
| Muscular Pain                  | 86                         | 24                            | 2.102 (1.47-3.00)               | <0.001  |
| Sun Screen use                 | 67                         | 8                             | 4.912 (2.494-9.674)             | <0.001  |
| Warm                           | 86                         | 24                            | 2.102 (1.472-3.000)             | <0.001  |
| Extremities                    |                            |                               | 0.510 (0.39-0.67)               | <0.001  |
| Dairy Products                 | 47                         | 54                            | 0.510 (0.39-0.67)               | <0.001  |
| Omeg3/CoL oil intake           | 14                         | 16                            | .513 (0.265-0.993)              | 0.037   |

Table 5: Multivariate determent and related factors:

| Item               | Odds Ratio (Confidence interval) | P value |
|--------------------|----------------------------------|---------|
| Gender             | 0.366 (0.161-0.833)              | 0.017   |
| Sun Screen use     | 2.762 (0.625-12.197)             | 0.180   |
| Omeg3/CoL oil intake | 0.155 (0.045-0.530)            | 0.003   |
| Sun Exposure Light Clothes | 6.750 (2.167-21.023)    | 0.001   |

Discussion:
Clinical or subclinical deficiency of Vitamin D plays a role in several clinical chronic problems such as cancer, cardiovascular disease and diabetes. Vitamin D deficiency associated with heart diseases, hypertension, obesity, cognitive impairments, Parkinson's diseases, fractures, autoimmune diseases, bacterial vaginosis, pelvic floor disorders, and age related macular degeneration (6). This result in marked health burdens at financial, mental and physical aspects.
In ongoing project, we will try to identify the prevalence and change in the pattern of vitamin D deficiency in sub-population through different regions in Libya, in order to provide elementary data for future health guidelines and planning to overcome this medical problem. We started by a study of two samples from cities in central region of Libya. Sixty three 63% of Libyans attending the clinics for regular checkup or for medical reasons were suffering of vitamin D deficiency. Libyans have more vitamin D deficiency than published data showing 50 % worldwide and 42 % in USA, (1), (2).

Dietary habits could contribute to that. Libyans did not eat fortified food, and no regulation for fortification of diets has been issued in Libya.

Pollution can absorb some of the sun's ultraviolet-B (UVB) rays, and affect vitamin D level. Vitamin D deficiency in these areas cannot be explained by pollution because they are non-industrial with relatively low population, nor by living at a high altitude which result in less access to the sun's (UVB) rays.

In current study, sample showed predominance of affected Female. This is could be explained by their life style where they spending little or no time outside and missing sun's rays as well as by regular use of Sunscreen. Our finding is consistent and confirms Office of Dietary Supplements (ODS) recommendation in people who use a lot of sunscreen or wear clothing that covers the body to include sources of vitamin D in their diet(7).

Underlying diseases such as gut, liver or renal diseases has outlined and it's not statistically significant . There is a difference in proportion of vitamin, D deficiency between male and female. Female are deficient in all age groups, but difference increase with increasing age, where females represent more than two thirds in adult and late adult groups. This finding is consistent with study conducted in Saudi Arabia 2017 (8).

Physiological factors such as age play a role. Vitamin D deficiency was highest in Adult, then late adult and children age group consequently. Recommended amount of Vitamin D for Children 1–13 years and adults 19–70 years is (600 IU) and for Late Adults is (800 IU) (9). Pattern of Vitamin Deficiency in different age group is different from a study performed in Qatar, where they found vitamin d deficiency is inversely related to age (10). This finding needs further study and explanation, because despite increase need for vitamin D in late adult, they are less deficient than adult group in our study.

Biological variability of being darker skin could play a role in vitamin D deficiency. Dark skin peoples need more sunlight exposure to absorb enough vitamin D. Libya is a sunny country, and black patients were not deficient to Vitamin D in our study. This is contradictory to the published data, where blacks were having vitamin D deficiency with high bone density (11) (12). However, blacks represent only 2.4% of patients, so the result is not conclusive because of low number.

Excess body fat affects vitamin D absorption, and being overweight correlates with low vitamin D (13). In our study we could not have body weight measurements in all cases. However, obesity cases were few.

In multivariant analysis, being a female (14), and lack of sun exposure in light cloths are risk factors for Vitamin D deficiency. This is consistent with report showed that sun exposure levels prevent winter vitamin D deficiency (15).

We found that omega3/col oil being a protective factor from vitamin D deficiency.

This is consistent with data published by Lee SM et al (16).

This study showed that Vitamin D deficiency is common in patients using sunscreen. However, our multivariate analysis done to study association between vitamin D deficiency and sunscreen uses, showed no association between sunscreen use as a cause of Vitamin D deficiency, in contradiction to all published data. This is could be attributed to use of small amount of sun screen in our study population, while other published data showed that using of large quantity of sun screen is a risk factor of vitamin D deficiency(7).

Vitamin D deficiency is associated with iron deficiency and heartdisease (14), (17). Fifty % of patients with female reproductive malignant tumors have vitamin D deficiency (18). This could emphasis the importance of
prevention of vitamin D deficiency. Conduction of a study to assess vitamin D status at national level in other regions, could give more representative data for prevalence of vitamin D deficiency among Libyans. Meanwhile we could start by rising awareness and promotion of Omega3/Col oil consumption as a preventive measure against vitamin D deficiency.

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