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Research Article

Study the Affect of Vitamin D Level in Relation to Behaviour, Knowledge and Motivating in Healthy and Patients with Myocardial Infarction in Libya

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Abstract

Background: Vitamin D deficiency is common in Libya, and worldwide. Recent research indicated there is a close relation between vitamin D deficiency and myocardial infarction (MI). Thus, the current study aims to study the knowledge, attitude and behavior to the prevalence of vitamin D deficiency in adult populations with or without CAD in Libya. The MI cases showed a higher exposure to the sun as compared to the controls (p = 0.001) which might associate with increased prevalence of vitamin D deficiency among adults with MI in different areas in Libya.

Materials and Methods: The present case control study consists of 130 patients suffering from CAD and 195 healthy controls. The study were carried out from hospitals and clinics in Benghazi, Tripoli, Tobruk, Igdabia, Sebha, Alkofra and Alkhomus, which are cover most areas in Libya. Questionnaire and interviews were taken to collect data on the subjects involved in this study, knowledge about vitamin D, sun exposure, social and behavioural backgrounds related to vitamin D. In addition, a biochemical study of vitamin D levels were measured.

Results: The results showed that Severe vitamin D deficiency [serum 25(OH)D < 8 ng/mL] was more seen in the MI cases than in the controls (43% and 8%, respectively). The MI cases showed a higher exposure to the sun as compared to the controls (p = 0.001). However, the controls were better aware about the usage of vitamin D supplements than the cases and hence consumed supplements (6.7% Vs 0.8%; p value of 0.010). Also, the controls had a higher food rich in animal butter (p = 0.001), fish (p = 0.003) and liver (p = 0.002) than the cases.

Conclusion: This study reveals that though the knowledge of the role of exposure to sun is high among the cases; however, their intake of vitamin D and calcium supplements was very low which contributes towards this deficiency among the cases suffering from CAD when compared to the control group.

Keywords: *Vitamin D; Behaviour; Knowledge; Motivating; Healthy; Myocardial Infarction*

Abbreviations

25(OH)D: 25-hydroxyvitamin D; MI: Myocardial Infarction

Introduction

Research studies have shown vitamin D deficiency and insufficiency states as a global phenomenon [1]. Vitamin D deficiency was found to affect 20 - 25% of population in most western countries [2]. The prevalence is higher in the Middle East and Arabic areas, approximately 58% - 70% of the population was affected [1]. Vitamin D significantly deficient in different areas in Libya, although the sunlight is plenty throughout the year. Vitamin D measurement studies have shown a high prevalence of this deficiency among the populations of Saudi Arabia. A recent studies showed that almost 45% of males and 68% of females in north Africa had vitamin D deficiency [5].

The biochemical and physiological role of vitamin D in calcium metabolism there are several studies worldwide have shown an association between vitamin D deficiency and the risk of MI and associated risk factors such as obesity, hypertension and diabetes [7]. No causal relationship has been found between vitamin D status and the risk of CAD in these studies [10].

Apart from sunlight as the source of vitamin D, there are a number of dietary sources, such as egg yolk, oily fish and commercially available supplements [11]. In spite of the adequate knowledge about the factors contributing towards a deficiency in vitamin D, knowledge about the health consequences of this deficiency is still lacking among the general public. Since there are a few studies focused on this area of Vitamin D [12].

We have shown the relationship between vitamin D deficiency [25(OH)D < 20 ng/mL] and the MI among adults [OR: 7.1, 95% CI: 3.0 - 15, p = < 0.001]. Furthermore, we found a strong relation between vitamin D deficiency [25(OH)D < 20 ng/mL] and diabetes in patients with MI [OR: 3.2, 96% CI: 1.03 - 8.6, p = 0.04] in Libya. We consider the high risk factors and rates of MI and obesity, diabetes, hypertension and high cholesterol levels, in Libya, also the high prevalence of vitamin D deficiency in the country [6].

Methods

Study population

This study was carried out during the summertime between June and August 2017 in different cities and towns in Libya. All the cases and controls included in this study were adults of both genders. A total of 260 cases and 380 controls were took part in this study. The cases and data were obtained from the cardiology department at Benghazi medical centre, Tripoli Medical Centre, Tajora cardiology hospital and the controls were obtained from same hospitals and private clinics who are known healthy people.

Exclusion criteria

In this study, patients with preexisting morbidities that affect vitamin D metabolism such as renal disease, liver disease, hypothyroidism, hyperthyroidism, hyperparathyroidism and osteoporosis have been excluded.

Ethical approval from university of Benghazi and signed consent was obtained from all cases and controls included in this study.

Data collection

A Questionnaire and interview were done with all cases and controls. Epidemiological data included participants' age, gender, marital status, level of education and other socio-demographic factors if any. Besides, behavioral data such as sun exposure including time-frequency, parts of the body and amount and duration of using supplementation, including vitamin D, calcium, multivitamins and calcium supplements with vitamin D, besides, questions related to the frequency of intake of some food rich in vitamin D sources, such as milk, butter, eggs, oily fish (tuna, sardines) and liver were also included.

Simultaneously data related to the participants' physical activity and smoking habits also was collected. A participant who smoked even one cigarette per day was considered as a smoker and those who quit smoking were considered as past smokers. The physical activity was classified into moderate exercise, such as walking; heavy exercise, such as running, aerobics or bicycling; and those who are doing only a little bit.

Biochemical study

10 ml of blood sample was collected through venipuncture for the assessment of serum vitamin D level using the Chemiluminescence Microparticle Immunoassay (CMIA) method on the Abbott Architect system.

Samples of blood were centrifuged at the speed of 2000 RPM for 15 minutes and the separated serum was frozen at -80°C until the analysis was performed.

All biochemical study was done in certified laboratories in the Benghazi medical center, children hospital and the red cross laboratory. The level of vitamin D deficiency and insufficiency were approved as serum level of 25(OH)D < 8 ng/mL and 8 to < 19.9 ng/mL, respectively, while normal vitamin D serum level was identified as 25(OH)D ≥ 25 ng/mL [13].

Statistical analysis

Statistical analyses were done in Cairo - Biostatistical center in Nasser City-Cairo-Egypt. Test was used to compare vitamin D levels [deficient as serum 25(OH)D < 8 ng/mL insufficient as serum 25(OH)D 8 to 19.9 ng/mL and adequate as serum 25(OH)D ≥ 25 ng/mL] between subjects with MI and controls. Chi-square test was used to compare the knowledge, attitude and behavioral patterns about sunlight exposure, intake of vitamin D rich diet and supplements between the cases with CAD and the normal healthy controls. Additionally, the Mann-Whitney U test was also done to compare these parameters between the cases and controls.

A p-value < 0.05 was considered statistically significant.

Results

The Characteristics features and lifestyle behaviors among case and control subjects are shown in table 1. Gender distribution and marital status was found to be uniform between cases and controls. Regarding age distribution, the case group was found to be slightly older (49 years and above) compared to the control group (74.6% Vs 69.7%) and 12.3% of the patients belonged to rural areas in comparison to the control group who constituted only 1% of the total controls. However, the controls were more educated, and more frequent smokers than the cases with MI.

	Cases (n = 260)		Controls (n = 390)	
	N	%	N	%
Age (years)				
< 50	66	24.9	118	29.8
≥ 50	194	75.2	272	69.9
Gender				
Male	164	62.8	246	66
Female	96	36.7	144	39
Marital status				
Single	14	5.2	68	17.1
Married	182	72	280	72.3
Education				
No or low education	134	52.1	56	13.9
High education	126	46.9	334	80
Smoking				
Current <20 cigarettes/day	46	17.7	78	20
Ex-smoker	66	25.4	20	5.1
Non-smoker	148	56.9	296	74.9
Exercise				
Never	88	33.8	168	43.1
Exercise	172	66.2	220	56.9

Table 1: *Characteristics features and lifestyle behaviors among case and control subjects.*

Prevalence of vitamin D deficiency

Figure 1 shows vitamin D level in cases and controls. There was a significant difference between the two groups with respect to vitamin D levels (p = < 0.001). Over 46% of the MI cases were classified as having a vitamin D deficiency [serum 25(OH)D < 8 ng/mL], whereas only 3% of the controls had a vitamin D deficiency. Likewise, the majority of the control subjects had adequate vitamin D levels [serum 25(OH)D ≥ 20 ng/mL] in contrast to the MI cases (65% and 27%, respectively).

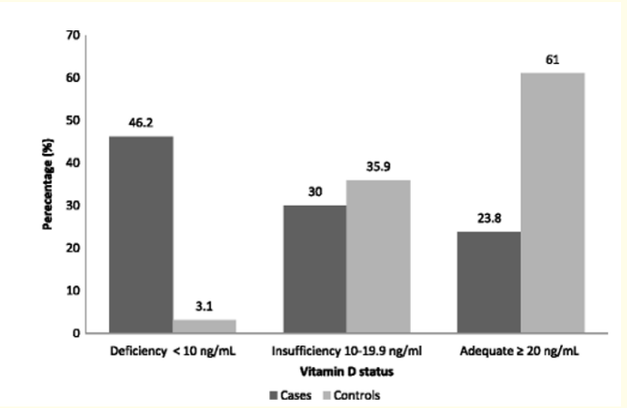

Figure 1: *Vitamin D status among case and control subjects.*

Vitamin D-related behaviors

Table 2 Shows that, the majority of cases and controls only exposed their faces and hands to sunlight (77% and 83%, respectively); however, a larger proportion of the cases exposed both arms to the sunlight compare to the controls (18% and 6%, respectively) (p = 0.001). Regarding consumption of multivitamin supplements, only 0.8% of cases consumed multivitamin supplements when compared to 6.7% of the controls. Regarding the consumption of vitamin D and calcium supplements, there was no significant difference between the two groups. Consumption of vitamin D rich diet was also compared between the two groups.

Variables	Cases (n = 260)		Controls (n = 390)		P-value*
	N	%	N	%	
Sun exposure parts of your body get exposed to the sun?					
Hand	24	9.4	58	15.2	.001
Face	0	0	0	0	
Face and hand	190	72.8	312	77	
Arms	46	18.3	20	4.8	
Legs	0	0	0	0	
The use of supplementation					
Vitamin D supplements					
Use	36	13.8	42	10.8	.403
Not	224	86.2	348	89.2	
Calcium supplements					
Yes	8	3.1	18	4.6	.488
No	252	96.9	372	95.4	
Multivitamin supplementations					
Use	2	0.8	26	6.7	.010
Not	258	99.2	364	93.3	
Calcium s with vitamin D supplements					
Use	2	0.8	10	2.6	.239
Not	258	99.2	380	97.4	

Table 2: *Vitamin D related habits by case and control groups.*

**P-value based on X2 -test.*

Table 3 represents the difference in the consumption of various foods rich in vitamin D between the two groups. However, eating butter (p = 0.001), oily fish (p = 0.034), and liver (p = 0.001) was more common among the controls than the cases. Regular intake of milk (3 - 6 times a week) was reported to be more common among the cases when compared to controls (54% Vs 36%). The control group (12%) reported higher consumption of butter in comparison with the cases (3.9%). Also the control group (25.6%) reported larger consumption of oily fish in comparison with the cases (15.4%).

Food items	Cases		Controls		Mann-Whitney U	Z-value	P-value*
	Median	Range	Median	Range			
Milk	0.50	0 - 3	0.28	0 - 3	9700.5	-3.701	.001
Butter	0	0 - 1	0	0 - 2	10157.0	-4.018	.001
Eggs	0.28	0 - 1	0.28	0 - 1	12205.5	-0.581	.561
Oily fish	0	0 - 1	0.14	0 - 2	10399.0	-2.877	.004
Liver	0	0 - 1	0	0 - 0.79	10700.5	-2.978	.003

Table 3: *Differences in intake of food items that rich in vitamin D between cases and controls.*

** P-value based on Mann-Whitney U test.*

Discussion

The present study showed that, the cases with MI had a higher rate of vitamin D deficiency as compared with the controls. A higher proportion of the MI cases were sufficiently exposed to sunlight. Almost the majority of the subjects in both groups were only exposing their faces and hands to sunlight. The controls had a higher intake of multivitamin supplements and a higher consumption of butter, oily fish, and liver compared with the MI cases, while milk intake was higher among the MI cases than the controls. Consumption of liver as a food source was reported among 9.2% of the control group as compared to 7,2% among cases. Regarding the intake of eggs, there was no significant difference between the two study groups. However, in the case of milk consumption, participants from the case group had increased intake. Thus, the current study revealed a higher prevalence of vitamin D deficiency among the patients diagnosed with CAD when compared with the control group. This happened despite the patients being exposed to sunlight. This could probably due to most of the subjects exposing only their faces and hands to sunlight.

Hence, according to this study, the participants from the control group had a higher intake of multivitamin supplements, butter, oily fish, and liver, though a lesser intake of milk when compared to the cases. This study showed a higher prevalence of vitamin D deficiency among cases of CAD compared to the controls. Many earlier studies have also shown a similar trend [22].

Participants of the control group had better knowledge about the importance of vitamin D in comparison with the cases. This could be due to a better education level among the controls. The same trend was also observed in a study from the Netherlands [27]. Approximately one-third of the controls and majority of the cases have no informations about vitamin D. There was a wide variation among the participants of both the groups regarding the dietary sources of vitamin D, such as milk, fatty fish, etc. Evidence from various studies have shown low levels of knowledge about the importance of vitamin D in health among populations of different regions and fatty fish (11% of the cases and 25% of the controls). A study involving the elderly population in the UK showed about a third of them were unaware of vitamin D [24]. Similar low awareness was also observed among Chinese women [25]. A survey in the Netherlands also showed that only 38% of the respondents were aware of vitamin D [27]. Participants from Australia showed relatively better awareness. In a survey done in Queensland showed that 69% of the respondents were aware about vitamin D and 50% of them also knew its significance in maintaining bone health [26]. A survey in Kuwait showed lower levels of knowledge about vitamin D [35].

In this survey, about 50% of the patients with CAD were ignorant about the relationship between sun exposure and vitamin D. However, the healthy controls were aware of its importance in health due to their higher knowledge level. Similar to our study, the cases from this survey also showed a positive attitude towards sun exposure than the controls. Regarding their concern towards the exposure to sunlight, 65% of the cases showed better concern when compared to only 50% of the controls. However, apart from exposure to sunlight, participants of the control group showed a better attitude towards vitamin D as such when compared to the cases. Participants from the case group showed a better attitude towards exposure to sunlight rather than about the importance of vitamin D in health. This is similar to our findings, as the current study highlighted contradictory results between knowledge about vitamin D and attitudes toward sun exposure.

These findings are similar to our study showing contrasting results between knowledge of exposure to sunlight and about the importance of vitamin D itself [27]. Thus, this study has shown a larger consumption of multivitamins among controls than the cases. These findings are consistent with the multivariant logistic regression analysis between vitamin D deficiency and low consumption of dietary sources and supplements of vitamin D and calcium. Likewise, the relationship between consumption of butter, oily fish, and liver except milk with normal levels of vitamin D among the control group. Overall, consumption of milk was relatively low in our sample, as 42% of the controls and a quarter of the cases reported never drinking milk every week. Thus milk intake was minimal in the control group.

Milk fortified with vitamin D is available under the Ministry of Health, Saudi Arabia to control vitamin D deficiency to some extent [34]. Saudi Arabian studies also showed a low intake of milk among their citizens [28]. Consumption of oily fish was also low among the cases of CAD in this study, despite being situated along the sea coast. Poor consumption of butter could be a dietary restriction planned for patients with CAD.

Conclusion

In conclusion, the present study showed that vitamin D deficiency was highly prevalent in subjects with MI than in the controls. Knowledge about vitamin D was higher among the controls and they had a higher intake of multivitamin supplements and a higher consumption of butter, oily fish and liver, while the MI cases had a higher intake of milk and were sufficiently exposed to sunlight. Our findings, thus, suggest that low levels of knowledge about vitamin D and the low consumption of vitamin supplementations, including vitamin D, calcium, multivitamin, and calcium supplements with vitamin D, may have contributed to the high prevalence of vitamin D deficiency among the MI cases. Although knowledge, and behaviors may not be strongly associated with each other in this study, the results have provided valuable information for the prevention of vitamin D deficiency, which may contribute to future interventions of MI. Moreover, additional studies using qualitative approaches are essential to explore the underlying reasons for low knowledge about vitamin D and behaviors related to vitamin D including vitamin D supplementation that might have contributed to the high burden of vitamin D deficiency in Libya.

Bibliography

1. Fields J., *et al*. "Vitamin D in the Persian Gulf: integrative physiology and socioeconomic factors". *Current Osteoporosis Reports* 9.4 (2011): 243-250.

2. Sadat-Ali M., *et al*. "Vitamin D levels in healthy men in Europe". *Annals of Saudi Medicine* 29.5 (2009): 378.

3. Looker A., *et al*. "Serum 25-hydroxyvitamin D status of adolescents and adults in two seasonal subpopulations from NHANES III". *Bone* 30.5 (2002): 771-777.

4. Ghannam N., *et al*. "Bone mineral density of the spine and femur in healthy Kwait females: relation to vitamin D status, pregnancy, and lactation". *Calcified Tissue International* 65.1 (1999): 23-28.

5. Van der Wielen RP., *et al*. "Serum vitamin D concentrations among elderly people in Europe". *Lancet* 346.8969 (1995): 207-210.

6. Ardawi M-S., *et al*. "High prevalence of vitamin D deficiency among healthy Saudi Arabian men: relationship to bone mineral density, parathyroid hormone, bone turnover markers, and lifestyle factors". *Osteoporosis International* 23.2 (2012): 675-686.

7. Elsammak M., *et al*. "High prevalence of vitamin D deficiency in the sunny eastern region of Saudi Arabia: a hospital-based study". *Eastern Mediterranean Health Journal* 17.4 (2011): 317-322.

8. Sedrani SH., *et al*. "Sunlight and vitamin D status in normal Saudi subjects". *The American Journal of Clinical Nutrition* 38.1 (1983): 129-132.

9. Kendrick J., *et al*. "25-Hydroxyvitamin D deficiency is independently associated with cardiovascular disease in the third National Health and nutrition examination survey". *Atherosclerosis* 205.1 (2009): 255-260.

10. Lee JH., *et al*. "Prevalence of vitamin D deficiency in patients with acute myocardial infarction". *The American Journal of Cardiology* 107.11 (2011): 1636-1638.

11. El-Menyar A., *et al*. "Low vitamin d and myocardial infarction risk factors in males and females from a sunny, rich country". *The Open Cardiovascular Medicine Journal* 6 (2012): 76.

12. Martins D., *et al*. "Prevalence of cardiovascular risk factors and the serum levels of 25-hydroxyvitamin D in the United States: data from the third National Health and nutrition examination survey". *Archives of Internal Medicine* 167.11 (2007): 1159-1165.

13. Anderson JL., *et al*. "Relation of vitamin D deficiency to cardiovascular risk factors, disease status, and incident events in a general healthcare population". *The American Journal of Cardiology* 106.7 (2010): 963-968.

14. Schöttker B., *et al*. "Vitamin D and mortality: meta-analysis of individual participant data from a large consortium of cohort studies from Europe and the United States". *British Medical Journal* 348 (2014): g3656.

15. Wang L., *et al*. "Circulating 25-hydroxy-vitamin D and risk of cardiovascular disease a meta-analysis of prospective studies". *Circulation: Cardiovascular Quality and Outcomes* 5.6 (2012): 819-829.

16. Trivedi DP., *et al*. "Effect of four monthly oral vitamin D3 (cholecalciferol) supplementation on fractures and mortality in men and women living in the community: randomised double blind controlled trial". *BMJ: British Medical Journal* 326.7387 (2003): 469.

17. Prince RL., *et al*. "Effects of ergocalciferol added to calcium on the risk of falls in elderly high-risk women". *JAMA* 168.1 (2008): 103-108.

18. Manousaki D., *et al*. "Mendelian randomization studies do not support a role for vitamin D in coronary artery disease". *Circulation: Cardiovascular Genetics* 10.1 (2016): 1-25.

19. Geleijnse JM. "Vitamin D and the prevention of hypertension and cardiovascular diseases: a review of the current evidence". *American Journal of Hypertension* 24.3 (2011): 253-262.

20. Alemu E and Varnam R. "Awareness of vitamin D deficiency among at-risk patients". *BMC Research Notes* 5.1 (2012): 17.

21. Kung AW and Lee K-K. "Knowledge of vitamin D and perceptions and attitudes toward sunlight among Chinese middle-aged and elderly women: a population survey in Hong Kong". *BMC Public Health* 6.1 (2006): 226.

22. Vu LH., *et al*. "Knowledge and attitudes about vitamin D and impact on sun protection practices among urban office workers in Brisbane, Australia". *Cancer Epidemiology, Biomarkers and Prevention* 9.7 (2010): 1784-1789.

23. Oudshoorn C., *et al*. "Better knowledge on vitamin D and calcium in older people is associated with a higher serum vitamin D level and a higher daily dietary calcium intake". *Health Education Journal* (2011).

24. Christie FT and Mason L. "Knowledge, attitude and practice regarding vitamin D deficiency among female students in Saudi Arabia: a qualitative exploration". *International Journal of Rheumatic Diseases* 14.3 (2011): e22-e29.

25. Aljefree NM., *et al*. "Association between vitamin D status and myocardial infarction disease among adults in Jordan: a case-control study". *Healthcare* 4.4 (2016): 77.

26. Aljefree N., *et al*. "Association between vitamin D status and cardio-metabolic risk factors among adults with and without coronary heart disease in Tunisia". *Journal of Diabetes and Metabolism* 7.707 (2016b): 2.

27. Al-Nozha MM., *et al*. "Coronary artery disease in Saudia Arabia". *Saudi Medical Journal* 25.9 (2004): 1165-1171.

28. Al-Nozha MM., *et al*. "Diabetes mellitus in Libya". *Saudi Medical Journal* 25.11 (2004): 1603-1610.

29. Al-Nozha MM., *et al*. "Al-Harthi SS: obesity in Lebanon". *Saudi Medical Journal* 26.5 (2005): 824-829.

30. Toher C., *et al*. "Relationship between vitamin D knowledge and 25-hydroxyvitamin D levels amongst pregnant women". *Journal of Human Nutrition and Dietetics* 27.3 (2014): 261-269.

31. Gallagher JC and Sai AJ. "Vitamin D insufficiency, deficiency, and bone health". *The Journal of Clinical Endocrinology and Metabolism* 95.6 (2010): 2630-2633.

32. Scragg R., *et al*. "Myocardial infarction is inversely associated with plasma 25-hydroxyvitamin D3 levels: a community-based study". *International Journal of Epidemiology* 19.3 (1990): 559-563.

33. Roy A., *et al*. "Independent association of severe vitamin D deficiency as a risk of acute myocardial infarction in Indians". *Indian Heart Journal* 67.1 (2015): 27-32.

34. Launiala A. "How much can a KAP survey tell us about people's knowledge, attitudes and practices? Some observations from medical anthropology research on malaria in pregnancy in Malawi". *Anthropology Matters* 11.1 (2009).

35. Al Bathi BA., *et al*. "Knowledge, attitude and practice of patients attending primary care centers toward vitamin D in Kuwait". *Alexandria Journal of Medicine* 48.3 (2012): 277-282.

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