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The Effect of Exercise in Vitamin D Level in Saudi Female

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A B S T R A C T

In recent years there has been a worldwide increase in the prevalence of Vitamin D deficiency, a problem that continues to grow. Saudi Arabia is not exception, as Most of Saudi population suffers from vitamin D deficiency. The aim of this study is to determine if exercise has an effect on vitamin D level in Saudi females. 65 Saudi female agree to participate in this study over 1 year period. We divide them into 3 groups. Group A: only receive advice for healthy food. Group B: receive as group A, and vitamin D supplement. Group C: as A&B, and had exercise in sport center. We found that group A participants had no significant change in the level of vitamin D. Vitamin D level in Group B increased up to 70% of the base reading. In Group C participants, the level of vitamin D increase three time the first reading and 50% reach normal range. The exercise has important effect in vitamin D level in Saudi females.

Introduction

In recent years the topic of Vitamin D has become a highly significant subject in the medical world because the prevalence of vitamin D deficiency has increased rapidly worldwide (Holick, 2005).

Saudi Arabia belongs to one of the sunniest regions in the World, and while the Saudi population should have adequate sun exposure, vitamin D deficiency remains prevalent in the country (Sedrani *et al.*, 1983). Various reasons include protection from strong heat during daytime, genetic and diet. Vitamin D deficiency was found to be very common among Saudi males and females (Alsuwadia *et al.*, 2013; Al-Turki *et al.*, 2008; Sadat-Ali *et al.*, 2009; Elsammak *et al.*, 2010Ardawi*et al.*, 2012). One study reported that 30 to 50% of children and adults in Saudi Arabia had 25-hydroxyvitamin D levels under 20 ng/ml (Sedrani, 1984). One interesting study revealed that the prevalence of vitamin D deficiency among female in Saudi Arabia ranged between 30%–80% (Al-Mogbel E Solaiman, 2012).

Vitamin D is an essential nutrient for bone health and a deficiency of the vitamin may result in many diseases such as cardiovascular diseases, infections and anemia (Holick, 2003). In adults, vitamin D deficiency causes osteomalacia and osteoporosis, with clinical findings of bone pain, muscle weakness, frequent falls and fragility fractures (Holick, 2008).

The etiology of vitamin D deficiency in Saudi Arabia women could be related to inadequacy of diet and sunlight exposure, as well as skin pigmentation playing a role (Siddiqui, 2007; Elsammak *et al.*, 2011).

As far we didn't find any study that neither can confirm nor deny the effect of exercise on vitamin D level. We aim in this study is to determine if exercise has an effect on vitamin D level in Saudi females.

Patients and methods

Sixty-five Subjects are invited to participate in this study. All of them were female teachers, Saudi nationals living in the Al Ahsa region of Saudi Arabia and were healthy with no associated medical problems.

The study was approved by King Fahd Hospital ethical committee. All subjects after fully explanations the purposes and scope of the study gave their consent to participate in the study. A full history and clinical examination were taken from all subjects participating in the study. Sixty-five Saudi females agree to participate in this study over 1 year period, but only 58 female complete the study over 1 year.

We divide the study subjects into three groups according to subject decision:

Group A: 18 Saudi female agree to receive only advice for healthy food.

Group B: 16 Saudi female agree to receive as group A, and vitamin D supplement.

Group C: 24 Saudi females agree to receive as group A& group B, and they agree to have exercise in sport center, and sun exposure.

All participants in the three groups were received adequate written information about the healthy food which positively affects the Vitamin D level.

The participants in group B &C received sufficient amount of Vitamin D and Calcium all through the study period.

The subjects in group C were instructed to attend biweekly sessions lasting approximately 1 h of strength, balance and aerobic workout for 1 year. Adequate exposure to sunlight was defined as regular exposure at least twice a week for 30 minutes with at least forearms and legs exposed to direct sunlight.

Exclusion criteria included: any acute or chronic illness, liver or renal, endocrine or autoimmune disease, taking any regular medication which can affect vitamin D level (e.g. vitamin D or calcium supplementation), elevated PTH level or impaired renal function.

At the beginning of the study, all the participants attend the surgical out-patients, where a full history and clinical examination were taken. Laboratory investigations included measurement of 25 (OH) Vitamin D, calcium, phosphorous, hemoglobin, and PTH level.

All subjects visited the clinic after 3 months, 6 months, 9 months, and 12 months. In each

visit, detail history, clinical examination and Laboratory investigations completed from all subjects.

Daily communication with all subjects through training fully registered female nurse, she send messages through the mobile 3 times every day. The message is to remind the participants and confirmation of their response. All participants in the three different groups asked to record their daily activity (healthy foods, Vitamin supplementation, exercise) on questioner forms, and all these monthly collected by the investigators.

Results and Discussion

Subjects included in this study were healthy female teachers and the mean age is (33 years). The majority of subjects in this study had Vitamin D deficiency (43%) and insufficiency (57%). None are ≥ 75 nmol/l (Table 1).

Table 2 show that no significant changes happened in group A, only 3 patients out of 18 had obvious improvement, but non be normal.

Table 3 illustrates the variation take place in group B. Hemoglobin increase 1.1g/dl, Calcium level increase 0.9 mg/dl, Phosphorus increase only 0.2. Vitamin D level increase in 80% of group C participants, and 5 subjects achieve the normal reading (31%).

Table 4 makes obvious the important of exercise in group C. Vitamin D level elevate in 100% of group C subjects, and 8 subjects (33%) are attain the normal reading.

Our study raised an observation that anemic subjects had lower Vitamin D deficiency or insufficiency more than non-anemic. The current study evaluated serum 25(OH) D and its relationship to PTH. It is a clear inverse relation.

The main sources of Vitamin D are diet and exposure to sunlight. If diet contains poor amount of Vitamin D or there is no exposure to sunlight, there will be Vitamin D deficiency (Webb *et al.,* 1988).

Many factors play an important role in the process of regulation of Vitamin D. Intestinal absorption, renal function; serum calcium level and parathyroid hormone (PTH) are examples of the factors that play role in Vitamin D regulation (Nykjaer *et al.,* 1999; Weisman *et al.,* 1979; Gray *et al.,* 1979; Stoffels *et al.,* 2007; Esteban *et al.,* 2007). Any abnormality in one of these factors could affect Vitamin D level.

Table.1 Base line laboratory result

	Group A: 18 PATIENTS	Group B: 16 PATIENTS	Group C: 24 PATIENTS
Hemoglobin(12–17 g/dl) mean	13.3	13.8	13.5
Calcium level (8.5-10.5mg/dl) mean	9.1	8.9	9.2
Phosphorus (2.5-4.9mg/dl) mean	3.2	3.3	3.3
Parathormone(1.3-7.6 Pmol) mean	6.7	6.9	6.9
25 (OH) D Normal (≥ 75nmol/L) Insufficient(25-75nmol/L) Deficient(<25nmol/L)	 0 11 7	 0 9 7	 0 13 11

Table.2 Result of the Group A: 18 patients

	Base line	3 months	6 months	9 months	12 months
Hemoglobin(12–17 g/dl) mean	**13.3**	**13.5**	**13.6**	**13.8**	**14**
Calcium level (8.5-10.5mg/dl) mean	**9.1**	**9.1**	**9.3**	**9.3**	**9.3**
Phosphorus (2.5-4.9mg/dl) mean	**3.2**	**3.2**	**3.2**	**3.3**	**3.3**
Parathormone(1.3-7.6 P mol) mean	**6.7**	**6.5**	**6.5**	**6.3**	**6.3**
25 (OH) D					
Normal (≥ 75nmol/L)	**0**	**0**	**0**	**0**	**0**
Insufficient(25-75nmol/L)	**11**	**11**	**12**	**12**	**14**
Deficient(<25nmol/L)	**7**	**7**	**6**	**6**	**4**

Table.3 Result of the Group B: 16 patients

	Base line	3 months	6 months	9 months	12 months
Hemoglobin(12–17 g/dl) mean	**13.8**	**14**	**14.3**	**14.6**	**14.9**
Calcium level (8.5-10.5mg/dl) mean	**8,9**	**9,2**	**9.4**	**9.6**	**9.8**
Phosphorus (2.5-4.9mg/dl) mean	**3.3**	**3.3**	**3.4**	**3.5**	**3.5**
Parathormone(1.3-7.6 P mol) mean	**6.9**	**6.6**	**6.1**	**5.7**	**5.1**
25 (OH) D					
Normal (≥ 75nmol/L)	**0**	**0**	**1**	**2**	**5**
Insufficient(25-75nmol/L)	**9**	**11**	**13**	**14**	**11**
Deficient(<25nmol/L)	**7**	**5**	**2**	**0**	**0**

Table.4 Result of the Group C: 24 patients

	Base line	3 months	6 months	9 months	12 months
Hemoglobin(12–17 g/dl) mean	**13.5**	**13.7**	**13.9**	**14.3**	**14.9**
Calcium level (8.5-10.5mg/dl) mean	**9.2**	**9.4**	**9.6**	**9.9**	**10.1**
Phosphorus (2.5-4.9mg/dl) mean	**3.3**	**3.4**	**3.4**	**3.5**	**3.6**
Parathormone(1.3-7.6 P mol) mean	**6.9**	**6.5**	**6.1**	**5.1**	**4.9**
25 (OH) D					
Normal (≥ 75nmol/L)	**0**	**1**	**3**	**5**	**8**
Insufficient(25-75nmol/L)	**13**	**16**	**18**	**19**	**16**
Deficient(<25nmol/L)	**11**	**7**	**3**	**0**	**0**

Surprisingly, level of Vitamin D in large percent of Saudi population is either insufficient or deficient despite the good amount of sunlight and fortified food products with vitamin D.

Many studies state that vitamin D deficiency is a global raising issue (Holick and Chen, 2008; Prentice, 2008), but the percentage of people with vitamin D deficiency globally is still unknown.

A retrospective review was done on patients visiting a tertiary care center in Riyadh, Saudi Arabia states that the over-all prevalence of vitamin D deficiency was 78.1% in females and 72.4% in males (Alfawaz *et al.*, 2014).

One study reported that 30 to 50% of children and adults in Saudi Arabia had 25-hydroxyvitamin D levels under 20 ng/ml (Sedrani, 1984).

This study was carried out in normal young adult females to determine the effect of exercise on vitamin D level, and this study has presented a preliminary evaluation of vitamin D status in young, apparently healthy female Saudi Arabians.

In our study, group A (18 patients) only received advice for healthy food. And as expected, there is no significant change in their vitamin D levels. Over 1 year no subject achieved normal vitamin D level (≥ 75nmol/L). However, 3 subjects with Deficient vitamin D level (<25nmol/L) achieved insufficient vitamin D deficiency (25–75 nmol/L). This is can be explained by the fact that food is not the main source of vitamin D.

In group B (16 patients) they received advice for healthy food and vitamin D supplement. Results of group B were similar to other studies (Ambroszkiewicz *et al.*, *et al.*, 2013). 5 subjects Lagunova2009; achieved Normal vitamin D level (≥ 75nmol/L) and all subjects with Deficient vitamin D level (<25nmol/L) achieved Insufficient vitamin D level (25–75nmol/L).

In group C (24 patients) they received advice, vitamin D supplementation, physical exercise and sun exposure. There was dramatic improvement on vitamin D levels in group C. 8 subjects achieved normal vitamin D level (≥ 75nmol/L) and 11 subjects transitioned to Insufficient vitamin D level (25–75nmol/L).

Physical activity has been identified as a contributor to adequate vitamin D concentration in some reports. The conflicting results may be explained by varying study conditions, including differences in latitudes, age and physical activity measurements. In our study, only women which reported similar physical activity levels and we found strong association between physical activity and improvement in vitamin D status (Johnson *et al.*, 2011).

This study has some limitations, including the small number of volunteers, the Selection and Randomization process, patients Compliance and the Communications methods with the participants.

In Conclusion increased outdoor physical activity among Saudi female should be encouraged to promote a more active life style that will counteract not only vitamin D deficiency but also conditions such as obesity.

Vitamin D supplementation in this vulnerable group is also suggested but needs further studies (dose, duration).

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