

EFFECT OF VITAMIN D AND ARGAN OIL SUPPLEMENTATION ON PHOSPHOCALCIC PROFILE IN OBESE AND NORMAL WEIGHT MOROCCAN SUBJECTS

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Abstract

Vitamin D has many essential roles for the proper functioning of the body, Argan oil (AO) is natural product recognized by its pharmacological properties in traditional medicine. Scientific evidence, which is scant, suggests a reduction in cardiovascular risk include several phenomena. This study aims to evaluate the effect of vitamin D and argan oil on phosphocalcic responses in obese and normal weight Moroccan population. A randomized, double-blind, placebo-controlled study was conducted, the effects of daily supplementation of 600 IU of vitamin D3, for three months, in 48 people, 24 people of normal weight and average age of 42 years and 24 obese people with an average age of 42 years and having a normal vitamin D concentration or presenting an insufficiency defined by 25(OH)D levels less than 12 ng/ml. Vitamin D and argan oil supplementation increased significantly the vitamin D level in blood ($p < 0.01$; +67%) as compared with control group, For phosphorus, a significant decrease has shown after vitamin D supplementation in individuals with normal weight ($P < 0.05$), but without effect in obese individuals ($P > 0.05$). In individuals with normal vitamin D status, a reduction in 25 (OH) D plasma concentration was recorded in control normal participants with normal during the experience ($p < 0.01$). But an increase of vitamin D plasma concentration was detected in vitamin D supplement group. Vitamin D supplementation increases the 25-OH-D plasma concentrations in normal ($p < 0.05$) and obese ($p = 0.05$) participants. Combined supplementation in vitamin D and argan oil increases the level of vitamin D in individuals with deficiency in Vitamin D, and can be recommended for the population of Kenitra. Further studies seem be necessary to evaluate the clinical effects of such supplementation

Keywords: Vitamin D Supplementation, Argan Oil, Obesity, Phosphocalcic Profile, Moroccan Population.

1. INTRODUCTION

Over the past few decades, obesity has emerged as a public health issue, resulting from a combination of genetic and environmental factors [1-3].

The recent progression of this syndrome is related to modifications in lifestyle, mainly immobility and eating habits (fast meals, diet rich in sugars, etc.). Indeed, the increased development of metabolic disorders and mainly obesity are associated with changes in the food table which has become rich in lipids and carbohydrates, and especially fructose [4-6].

Fructose high diet constitutes a risk factor for metabolic disorders [8,9], in addition, it negatively affects the structure and functioning of the nervous system and mainly the brain. Physiologic and psychiatric symptoms are common in obesity and significantly influence the social functioning and quality of life of people with metabolic disease [10, 11]. Although, the undergoing physiological processes of the origin of neuropsychiatric symptoms linked to obesity are still under study and require further study, it involves inflammatory processes.

Numerous studies have identified weight gain as a form of moderate chronic inflammation in obese individuals, characterized by dysregulated production of adipokines and cytokines by adipose tissue. This dysregulation leads to an increased risk of developing and complicating metabolic diseases. In brain cells, disruptions in adipokine synthesis can result in various changes, including neurodegeneration, cognitive and mood disorders, and alterations in blood flow [12].

Diet plays a pivotal role in determining susceptibility to various diseases, but it can also confer significant health benefits. Numerous studies have demonstrated the positive effects of certain foods on overall health and well-being [2].

In last years, considerable attention has been directed towards utilizing various plants for their therapeutic properties, attributed to their potent medicinal benefits, minimal side effects, and relatively affordable cost [13, 14]. The therapeutic effects of these plants are associated with secondary metabolites such as flavonoids, polyphenols, saponins, terpenoids, and alkaloids. Phenols derived from plants exhibit therapeutic potential in addressing metabolic disorders such as obesity, brain cell disorders, atherosclerosis, and urolithiasis [15-19].

Honey is described as a natural sweet substance created by bees through the collection and transformation of plant nectar, secretions from living parts of plants, or excretions left by sucking insects. Bees process these materials by mixing them with specific clean substances, then deposit, dehydrate, store, and allow them to ripen in the combs within the hive.

Research endeavors are focused on investigating the hypoglycemic properties of medicinal plants and traditional bee products. The objective is to uncover novel natural remedies that are more potent, less harmful, and have fewer side effects. However, this field remains relatively underexplored in Morocco. In this context, our study aims to assess the impact of honey on weight status and various biological parameters, including glucose levels, lipid profiles, and liver enzyme activity, in rats subjected to high fructose intake during prepuberty and adolescence.

Honey is widely used as nutriment and a therapeutic supplement by world population including Moroccan people. Related to its therapeutic properties, mainly its antimicrobial, antioxidant and anti-inflammatory activities [10].

The objective of this study was to assess the combined effect of vitamin D and argan oil in phosphocalcic profile and vitamin D status in normal and obese patients from Kenitra province.

2. MATERIALS AND METHODS

2.1 Experimental Design

A randomized, double-blind, placebo-controlled study was conducted, the effects of daily supplementation of 600 IU of vitamin D3, for three months, in 48 people, 24 people of normal weight and average age of 42 years and 24 obese people with an average age of 42 years and having a normal vitamin D concentration or presenting an insufficiency defined by 25(OH)D levels less than 12 ng/ml insufficiency defined by 25(OH)D levels less than 12 ng/ml [20].

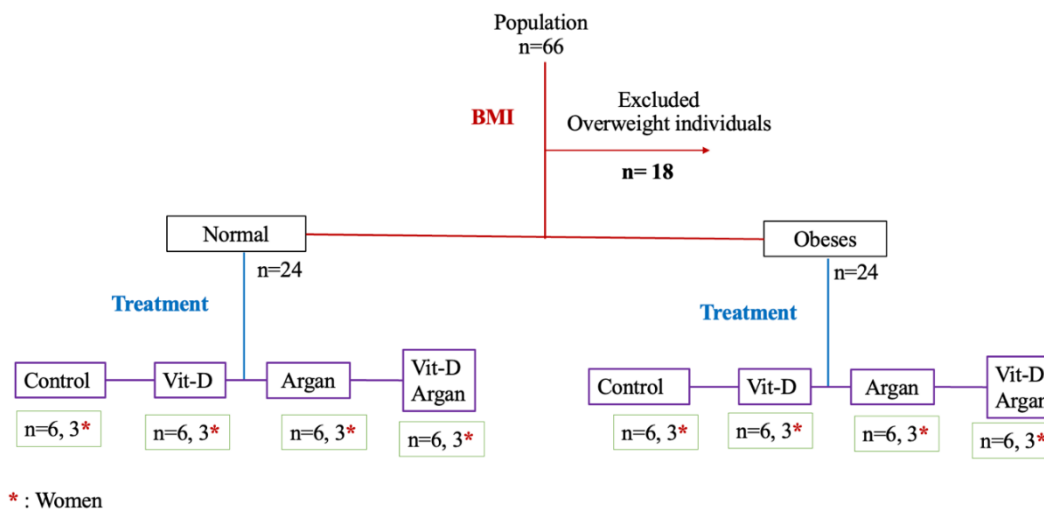


Figure 1: Experimental Protocol for the Study of the Combined Effect of Vitamin D and Argan Oil on Phosphocalcic Metabolism (* woman)

2.3 Analysis of Blood Samples

The effect of vitamin D and argan oil supplementation was evaluated by measuring biological parameters of phosphocalcic homeostasis including 25(OH)D, parathyroid hormone (PTH), serum calcium and phosphoremia at the beginning and at the end of the test. Blood samples were taken in the morning on an empty stomach, serum was collected and then stored at -20°C . Serum calcium and phosphorus were measured using the COBAS e 411 automated analysis system (automated immunological analysis system). The instrument uses electrochemiluminescence (ECL) technology to provide a wide variety of tests. The dosage of Vitamin D and PTH was carried out by the MINI VIDAS machine.

2.3 Statistical Analysis

The comparison of the basal values with the final values was made by non-parametric tests due to the asymmetric distribution of the data according to the Hodges-Lehmann method and the Wilcoxon test [17]. The Kolmogorov-Smirnov test was used to test the normality of the distribution of the variables. Serum calcium, PTH, phosphorus, and 25(OH) D were tested with the ANOVA test. Post-hoc analyzes were carried out with the Dunnett test and the Tukey test. Differences were considered significant with $P < 5\%$.

2.4 Ethics

Participants are informed of the objectives of the survey, the medical examinations carried out and data protection, both in the transmission letter and orally, from their general practitioner or nursing staff. Participants provided informed consent (required) before participating in the data collection process.

Data collection teams explained the legal aspects of informed consent in simple language to participants, asked each participant to read the form, and ensured they understood key content. Participants had the opportunity to ask questions at any time during the visit to the medical offices where the medical examinations were carried out. Participants were also provided with contact numbers for further queries even after visiting the exam center.

3. RESULTS

The majority of participants are aged between 30 and 39 years (41.7%, n=20). According to weight status, 50% have normal weight (n=24) and 50% are obese (n=24). According to the level study, 20.9% of the participants have primary school and 79.1 % have secondary school level or higher (table 1).

Figures 2 and 3 shows the effects of 25 (OH) D3 and argan oil supplementation on blood levels of vitamin D. compared to control group, supplementation on vitamin D increase level on vitamin D in normal and obese patients, also supplmenattion on argan oil have a significant impact in vitamin D blood level. The graphs show that combined administration of vitamin D and argan oil have a highly increase the blood level of vitamin D compared to control group (P < 0.05). The results also show that vitamin D and argan oil supplementation increase plasma 25-OH-D levels.

Table 1: Demographic and Anthropometric Characteristics of Participants

		Number	Percentage
Gender	Female	24	50.0
	Male	24	50.0
Age classes	20-29	13	27.0
	30-39	20	41.7
	40-49	10	20.9
	50-59	5	10.4
Weight status	Normal	24	50.0
	Obese	24	50.0
Family situation	Single	10	20.9
	Married	38	79.1
Level study	Primary school	10	20.9
	Secondary school and higher	38	79.1

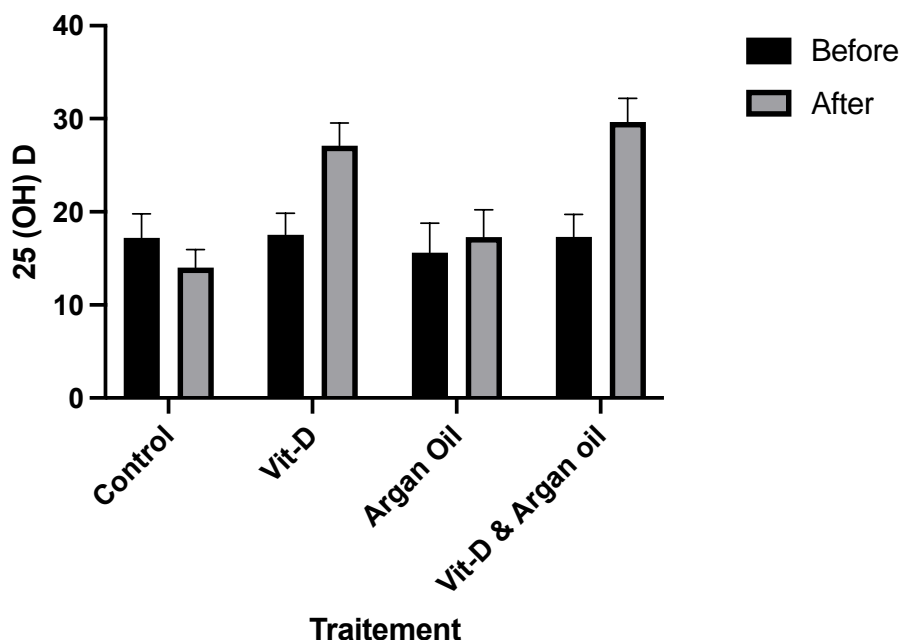


Figure 3: Effect of Vitamin D and Argan Oil on the Serum Concentration of Vitamin D in Normal People (n=24)

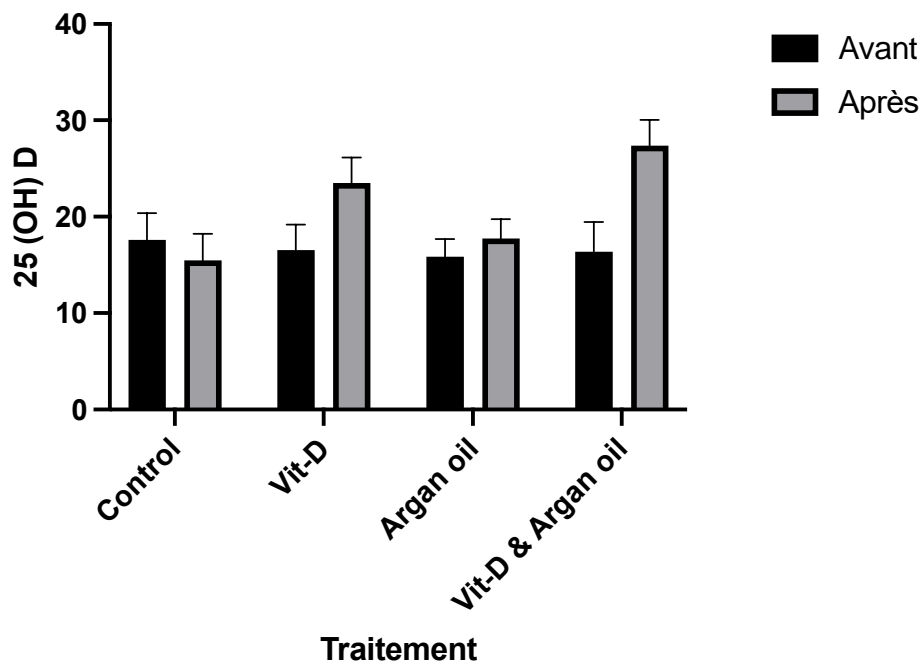


Figure 4: Effect of Vitamin D and Argan Oil on the Serum Concentration of Vitamin D in Obese People (n=24)

4. DISCUSSION

This study aimed to assess the effect of vitamin D and argan oil supplementation on phosphocalcic profile in obese and normal weight Moroccan subjects.

In previous study, we have showed a beneficial effect of vitamin D supplementation on phosphocalcic profile.

Several studies report vitamin D insufficiency defined by a 25(OH)D concentration less than 20 to 30ng/ml and a deficiency defined by a concentration less than 10ng/ml. In France [20, 21], the prevalence of vitamin D insufficiency (concentration less than 30ng/ml) was estimated at 78% among women aged 50 and over. Finally, in their study carried out on 55 sites in 18 countries on different continents (Europe, Asia, Oceania, Latin America), Lips et al. found a vitamin D deficiency (defined by a 25(OH)D concentration less than 30ng/ml) of 50 to 60% in osteoporotic women [22-25].

In individuals with normal vitamin D status (Figure 2), a reduction in plasma 25(OH)D concentration was recorded in control participants with normal levels during the experiment ($p < 0.01$). But an increase in plasma vitamin D concentration was detected in the group receiving vitamin D supplement ($p = 0.05$) and individuals receiving argan oil supplement. Then we note a significant increase in the concentration of vitamin D in patients having received vitamin D and argan oil [26-28].

The same thing was observed in obese individuals. In our selected population, the prevalence of hypovitaminosis D was estimated at 50%. Among the patients insufficient in Vitamin D, 64 were included and received either placebo ($n = 24$) or VitD supplementation ($n = 40$), 46.1% were osteoporotic (T-score < 2.5 SD at lumbar level and/or at hip level). During the study, no serious adverse effects attributable to the treatments were observed [29, 30].

There is general consensus that a daily intake of 400 IU of vitamin D can prevent nutritional rickets in infants and children [31-32]. However, the impact of vitamin D deficiency on the skeletal health of adults, particularly those over 65 years of age, and the potential non-skeletal effects of vitamin D are subject to debate [32]. Some claim that vitamin D supplementation is ineffective. On the contrary, others suggest that the recommended intake of vitamin D should be much higher than that currently achieved by the general population. They suggest aiming for concentrations of 25-hydroxyvitamin D (25OHD) comparable to those observed in some equatorial African tribes with a sun-exposed lifestyle resembling that of early humans [33, 34].

The particularity of this present study is that we evaluated the combined effect of supplementation with vitamin D and argan oil [35, 36].

Further studies will be necessary to assess the impact of vitamin D supplementation on phosphocalcic metabolism. Analyzes of other blood parameters are currently underway to try to elucidate the mechanisms underlying phosphocalcic metabolism. The use of medicinal plant extracts can be evaluated in the evolution of phosphocalcic metabolism in response to vitamin D supplements, as shown in other experimental studies [37, 38]. The metabolic effects of supplementation are still controversial, hence the need to expand studies to better demonstrate these effects.

A certain number of factors can explain vitamin D deficiency such as clothing, skin pigmentation, use of sunscreen, time of exposure, season, latitude. Vitamin D synthesis is also influenced by age (decreased production capacity). Elderly people, particularly those living in institutions, represent a population particularly at risk of vitamin D deficiency (low exposure, increased needs, etc.) [39, 40].

Our experiment's findings also suggest that combined supplementation of vitamin D and argan oil plays an important role in maintaining of a normal weight status and a basic blood vitamin D [41, 42]. This aligns with several prior rodent studies indicating that oil argan supplementation have benefic effects in several functions [43]. Its therapeutic proprieties are related to its richness on antioxidants and essential fatty acids, but also vitamin A and vitamin E (Tocopherol) and explain its exploration in the therapy of other diseases [44, 45].

5. CONCLUSION

In summary, Argan oil and vitamin D supplementation increases plasma vitamin D levels. The use of moderate daily doses of vitamin D rather than high doses administered intermittently would be preferable in subjects with vitamin D deficiency. Further studies will be needed to better understand the role of vitamin D supplementation on phosphocalcium and vitamin D metabolism. Therefore, a study is planned to evaluate changes in phosphocalcium metabolism in a sample of Moroccans during Ramadan fasting. Larger studies could confirm our results and demonstrate the benefits of vitamin D supplementation in deficient patients.

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