



Dietary Intake of Vitamin D in the Moroccan Elderly

El-Houcine Sebbar^{1,2,3*}, Hicham Sam^{1,3}, Ennouamane Saalaoui¹
and Mohammed Choukri^{1,2,3}

¹ Laboratory of Biochemistry and Biotechnology, Faculty of Sciences of Oujda, Mohammed First University, Oujda, Morocco

² Faculty of Medicine and Pharmacy of Oujda, Mohammed First University, Oujda, Morocco

³ Central Laboratory, The Mohammed VI University Hospital, Oujda, Morocco

*Corresponding e-mail: e.sebbar@ump.ac.ma

ABSTRACT

Aim: Vitamin D deficiency is common in the elderly. The aim of our work is to evaluate the dietary intake of vitamin D in the Moroccan elderly. **Methods:** This study included 159 subjects aged over 60 years who performed a vitamin D questionnaire (VDQ), covering the consumption of four foods with high vitamin D content (fish, milk, margarine and yoghurt). **Results:** The average dietary vitamin D intake was 2.7 µg/day. This observational study in Moroccan elderly indicates a high prevalence of insufficient vitamin D intake, and below the recommended consumption values, particularly in those aged over 70 years. **Conclusion:** Inadequate vitamin D intake is common among the Moroccan elderly. To fight against this situation, initiatives must be implemented, including improved population education, lifestyle, and vitamin D supplementation, in order to avoid serious adverse health consequences of bone.

Keywords: Dietary intake, Vitamin D, Questionnaire, Elderly

INTRODUCTION

Vitamin D plays an important role in the health and growth of bones. In addition to its classic effects on phosphocalcic metabolism, vitamin D is experiencing more and more effects on other functions of the body. Vitamin D is essential for calcium homeostasis and bone health, but also for immune function, muscle and cardiovascular system. In humans, vitamin D comes in two forms, vitamin D3 or cholecalciferol, of animal origin, and vitamin D2 or ergocalciferol of plant origin. There are rare dietary sources of vitamin D3, especially marine fatty fish, vitamin D3 supplementation or vitamin D2. The skin can synthesize vitamin D3, from 7-dehydrocholesterol, under the action of ultraviolet B (UVB) radiation which represents the main natural source of vitamin D [1-3]. Most studies focus on the bone effects of vitamin D. Osteoporotic fractures represents a real public health problem. Most epidemiological studies show that vitamin D deficiency is common in the elderly, and consider that a concentration of 25 (OH) D >30 ng/ml is necessary to prevent osteoporotic fractures. In addition, most studies agree that only double vitamin D and calcium supplementation is effective in preventing osteoporotic fractures with vitamin D doses of 800 to 1000 IU/day. Most data from the current literature suggest that vitamin D would improve functional performance (motive force, balance) and reduce the risk of severe complications in the elderly such as falls and fractures [4-8]. We performed this work in order to evaluate the dietary intake of vitamin D in the Moroccan elderly.

METHODS

This study included 159 subjects aged over 60 years, to describe the dietary intake of vitamin D in the Moroccan elderly. All participants performed a vitamin D questionnaire (VDQ), covering the consumption of four foods with high vitamin D content (fish, milk, margarine and yoghurt).

The VDQ was carried out as an interview by trained personnel. Subjects were asked about their usual food intake behavior in the six months prior to the study. Questions were asked on how often foods were consumed and the amount of a typical serving as listed in Table 1. For milk, yoghurt/sour milk and margarine, questions on the fat content were also asked. Dietary intakes were calculated using computer software Dietist XP version 3.1. Vitamin D

supplement use was not included in the analysis. The subject’s daily energy requirements were calculated using FAO/WHO/UNU’s equation based on body weight and age group [9,10].

RESULTS

Our series included 159 subjects aged over 60 years, 45% of whom were male (n=72) and 55% female (n=87). The average age is 69.27 ± 9.33 . The average dietary vitamin D intake was 2.7 ± 0.9 µg/day assessed by VDQ. 2.9 ± 1.13 µg/day in male, and 2.5 ± 0.99 µg/day in female. The average energy intake reported in the VDQ was 5.7 ± 1.12 MJ. The dietary intakes of vitamin D by food group are presented in Table 1. For the age groups 60-70 and >70 years, the daily intakes of vitamin D were respectively 2.9 and 2.4 µg/day (Figure 1).

Table 1 Intake of vitamin D as reported in vitamin D questionnaire by food group

Sources	Fish			Milk			Yoghurt			Margarine		
	T	M	F	T	M	F	T	M	F	T	M	F
Intake of vitamin D (µg/day)	0.8	0.9	0.7	1.1	1.1	1.1	0.6	0.5	0.7	0.2	0.2	0.2

T: Total; M: Male; F: Female

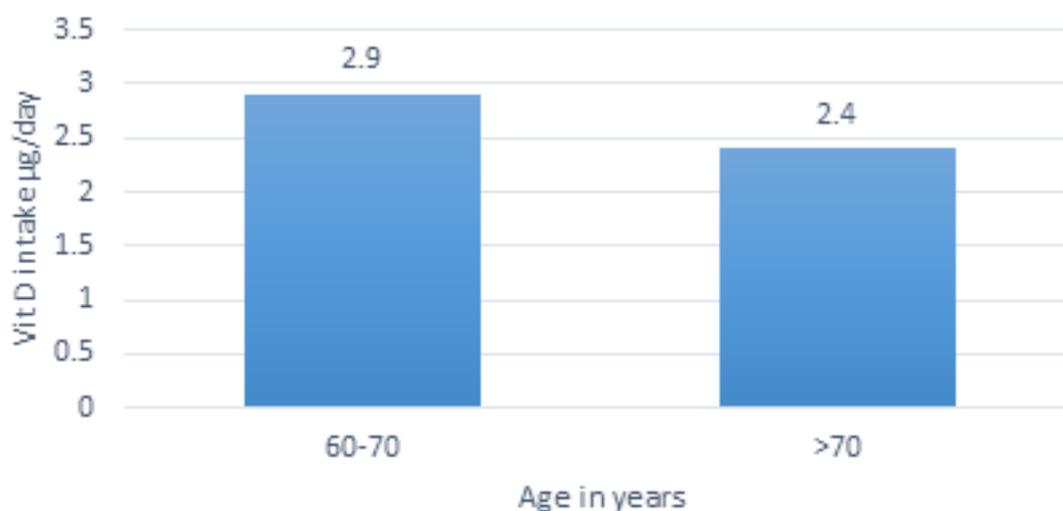


Figure 1 Median dietary vitamin D intake (µg/day) according to age

DISCUSSION

The prevalence of vitamin D deficiency is high in the elderly population; it is still variable according to the studies probably due to the use of different definitions to identify the subjects in deficiency, the age of the studied population and the sex. The vitamin D deficiency is associated to increased risk for osteoporosis, type 2 diabetes, cancer, autoimmune diseases, depression, and reduced mobility [11].

Vitamin D is a nutrient obtained from limited products in the Moroccan diet. In addition, in Morocco some food products such as milk products or oils are supplemented with vitamin D at low doses [12]. Despite the problem of vitamin D deficiency in the general Moroccan population including elderly, no questionnaire validated or specified to the frequency of consumption of foods rich in vitamin D has been designed or applied in Morocco so far. The recommended daily vitamin D intake is confused and varies according to age, physiological state, season and geographical location [13]. Dietary reference values for vitamin D for elderly varies according to studies (Table 2).

Table 2 Dietary reference values for vitamin D for elderly

Recommending Agency	Dietary reference values for vitamin D (µg/day)
IOM [14]	20
WHO/FAO [10]	10 (60-65 years)
	15 (+65 years)

IOM: Institute of Medicine; WHO/FAO: World Health Organization/Food and Agriculture Organization

The results of this observational study in Moroccan elderly indicates a high prevalence of insufficient vitamin D intake, and below the recommended consumption values (Table 2), especially in those aged over 70 years. The lower median intake of vitamin D can be explained by the VDQ covered only four foods. The VDQ was included only four foods with high vitamin D content (fish, milk, margarine and yoghurt/sour milk). Although the amount of vitamin D obtained from supplements was not specified in this study. There are many limitations in our study design. The study was observatory in its nature. The results may be biased by the selection of participants who consented to the study and contacted the interviewers, subjects' participants may be more aware of their health needs, compared to others who did not agree to participate. This disparity may have led to an underestimation of the actual level of vitamin D deficiency in Moroccan elderly. In addition, the results of the study are based on the patient's self-assessment, which is subject to the influence of memory and other subjective factors [14-17].

CONCLUSION

Inadequate vitamin D intake is common among the Moroccan elderly. To fight against this situation, initiatives must be implemented, including improved population education, lifestyle and vitamin D supplementation, in order to avoid serious adverse health consequences of bone.

DECLARATIONS

Conflict of Interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

Ethical Standards Statement

Our study has been approved by the appropriate ethics committee and has therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

REFERENCES

- [1] Souberbielle, Jean-Claude. "Actualités sur la vitamine D." *Cahiers de nutrition et de diététique*, Vol. 48, No. 2, 2013, pp. 63-74.
- [2] Holick, Michael, F. "Sunlight, vitamin D and health: A D-lightful story." *Solar radiation and human health*, edited by Espen Bjertness, The Norwegian Academy of Science and Letters, 2008, pp. 147-66.
- [3] Adams, John S., and Martin Hewison. "Update in vitamin D." *The Journal of Clinical Endocrinology & Metabolism*, Vol. 95, No. 2, 2010, pp. 471-78.
- [4] Vieth, Reinhold. "Vitamin D supplementation, 25-hydroxyvitamin D concentrations, and safety." *The American Journal of Clinical Nutrition*, Vol. 69, No. 5, 1999, pp. 842-56.
- [5] Hacker-Thompson, Andrea, Monique Schloetter, and Deborah E. Sellmeyer. "Validation of a dietary vitamin D questionnaire using multiple diet records and the block 98 health habits and history questionnaire in healthy postmenopausal women in northern California." *Journal of the Academy of Nutrition and Dietetics*, Vol. 112, No. 3, 2012, pp. 419-23.
- [6] Papaioannou, Alexandra, et al. "A randomized controlled trial of vitamin D dosing strategies after acute hip fracture: no advantage of loading doses over daily supplementation." *BMC Musculoskeletal Disorders*, Vol. 12, No. 1, 2011, p. 135.
- [7] Thompson, Frances E., and Tim Byers. "Dietary assessment resource manual." *The Journal of Nutrition*, Vol. 124, No. 11, 1994, p. 2245S.
- [8] Francis RM, et al. "National Osteoporosis Society Practical Clinical Guideline on Vitamin D and Bone Health." *Maturitas*, 2014.
- [9] Black, Dennis M., and Clifford J. Rosen. "Post-menopausal osteoporosis." *New England Journal of Medicine*, Vol. 374, No. 3, 2016, pp. 254-62.
- [10] Joint, F.A.O., and World Health Organization. "Vitamin and mineral requirements in human nutrition." 2005.
- [11] International Osteoporosis Foundation. "Osteoporosis in the EU: Improving the assessment of fracture

-
- risk.” *International Osteoporosis Foundation*. 7 Sep. 2006, <http://www.iofbonehealth.org/sites/default/files/PDFs/EU%20Reports/eu-report-2006.pdf>. Accessed 11 Mar. 2013.
- [12] Ministry of Health, Morocco. “Guide Marocain de Nutrition.” <http://www.sante.gov.ma/Publications/Guides-Manuels/Documents/GUIDE-M-P.pdf>. Accessed 20 Jul. 2017.
- [13] Bouvard, Béatrice, et al. “Extra-skeletal effects of vitamin D: facts, uncertainties, and controversies.” *Joint Bone Spine*, Vol. 78, No. 1, 2011, pp. 10-16.
- [14] Ross, A. Catharine, et al. “The 2011 report on dietary reference intakes for calcium and vitamin D from the Institute of Medicine: what clinicians need to know.” *The Journal of Clinical Endocrinology & Metabolism*, Vol. 96, No. 1, 2011, pp. 53-58.
- [15] Pietinen, Pirjo, et al. “FINDIET 2007 Survey: Energy and nutrient intakes.” *Public Health Nutrition*, Vol. 13, No. 6A, 2010, pp. 920-24.
- [16] Morgan, Karen, et al. “Slán 2007: Survey of lifestyle, attitudes and nutrition in Ireland alcohol use in Ireland: A profile of drinking patterns and alcohol-related harm from SLÁN 2007.” 2009.
- [17] Turrini, A., et al. “Food consumption patterns in Italy: the INN-CA Study 1994-1996.” *European Journal of Clinical Nutrition*, Vol. 55, No. 7, 2001, p. 571.