

Prevalence of Vitamin D Inadequacy among Postmenopausal Women

1. Shadab Akhtar 2. Roohullah Jan

1. Registrar, Obst. & Gynae, 2. Medical Officer, of Orthopedics & Trauma,
Khyber Teaching Hospital, Peshawar, Khyber Pakhtunkhwa.

ABSTRACT

Objective: To evaluate serum vitamin D levels and factors related to vitamin D inadequacy in postmenopausal women.

Study Design: Observational Cross-sectional study

Place and duration of Study: This study was conducted in Outpatient departments of Obstetrics & Gynaecology and Orthopedics & Traumatology, Khyber Teaching Hospital, Peshawar from Dec 2011 to Nov 2012.

Materials and Methods: During the study period, 200 postmenopausal women presenting to Orthopedics and Gynecology outpatient departments of Khyber Teaching Hospital were randomly recruited to the study. Women with active liver and /or kidney disease and those taking drugs affecting calcium and vitamin D metabolism were excluded from the study. Serum Vitamin D levels were analyzed and were categorized as adequate (more than 30 ng/ml), insufficient (20–30 ng/ml), mild deficiency (10–20 ng/ml), moderate (5–10 ng/ml) and severe (< 5 ng/ml).

Results: The study included 200 postmenopausal women. Mean age was 58 years with a mean BMI of 24.3 kg/m². Mean Vitamin D levels were 14.7 ng/ml with a range of 4–62 ng/ml. Vitamin D levels were adequate in only 19% of women. Twenty two percent had insufficient levels. Vitamin D deficiency was present in 59 % of postmenopausal women. Thirty three percent had mild deficiency while 21 % had moderate deficiency. Five percent of women were severely deficient.

Conclusion: More than half of postmenopausal women in our province have vitamin D deficiency underscoring the need for vitamin D supplementation in this vulnerable population. Prevention and early detection of hypovitaminosis D is the key to reduce the incidence of osteoporosis among postmenopausal women.

Key Words: Postmenopausal women, Vitamin D deficiency

INTRODUCTION

Vitamin D is a group of fat-soluble steroids responsible for enhancing intestinal absorption of calcium and phosphate¹. In humans, the most important compounds in this group are vitamin D3 (also known as cholecalciferol) and vitamin D2 (ergocalciferol). Cholecalciferol and ergocalciferol can be ingested from the diet and from supplements.^{1,2} The body can also synthesize vitamin D (specifically cholecalciferol) in the skin, from cholesterol, when sun exposure is adequate (hence its nickname, the "sunshine vitamin").² Vitamin D deficiency is known to cause several bone diseases including: Rickets, Osteomalacia and Osteoporosis, a condition characterized by reduced bone mineral density and increased bone fragility.^{3,4} With increasing life expectancy there is exponential increase in osteoporotic fractures.⁴ It is projected that the number of hip fractures worldwide will exceed six million by 2050.⁵ Postmenopausal women constitute a particularly vulnerable group for osteoporotic fractures. Estrogen deficiency leads to accelerated decline in bone mineral density. Vitamin D deficiency adds further fuel to the fire by decreasing dietary calcium absorption.^{5,6} Subsequently, the body uses calcium from skeletal stores, which can weaken bones making postmenopausal women with low levels of vitamin D at increased risk for osteoporotic fractures.^{6,7,8}

Vitamin D deficiency (Hypovitaminosis D) is typically diagnosed by measuring the concentration in blood of the compound 25-hydroxyvitamin D (calcidiol), which is a precursor to the active form 1,25-dihydroxyvitamin D (calcitriol).^{9,10} It reflects vitamin D produced in the skin as well as that acquired from the diet, and has a fairly long circulating half-life of 15 days.⁹ It does not, however, reveal the amount of vitamin D stored in other body tissues.^{9,10} The level of serum 1,25-dihydroxyvitamin D is not usually used to determine vitamin D status because it has a short half-life of 15 hours and is tightly regulated by parathyroid hormone, calcium, and phosphate, such that it does not decrease significantly until vitamin D deficiency is already well advanced.^{9,10,11}

Vitamin D deficiency is preventable and heightened awareness is necessary to institute public health programs to ensure adequate vitamin D nutrition particularly in postmenopausal women. The study intends to estimate the prevalence of vitamin D deficiency among postmenopausal women to help assess the level of risk of osteoporotic fractures.

MATERIALS AND METHODS

This study was conducted in Khyber Teaching Hospital Peshawar. Over a one year study period, 200 postmenopausal women presenting to outpatient

departments of Orthopedics and Gynecology were enrolled in the study. Inclusion criteria were established postmenopausal state for at least one year. There was no age limit. Written informed consent was taken from all women. Detailed history was taken from all women with particular focus on dietary habits, physical activity, lifestyle, previous history of fractures and exposure to sunlight. A thorough clinical examination was carried out. Women with deranged renal function, abnormal thyroid function, significant liver disease, history of cancer, history of fracture and therapy with any other drug that affect skeleton like steroids, including calcium and vitamin D supplements were excluded from the study. Venipuncture was done and blood sample was taken and sent to laboratory for analysis of vitamin D levels. For uniformity, sample analysis was done by the same laboratory in all patients. Once laboratory reports were received, categorizations of vitamin D levels were done. A cutoff of >30 ng/ml was used as adequate levels. Vitamin D levels of 20–30 ng/ml were relabeled as insufficient. Levels below 20 ng/ml were taken as vitamin D deficient state with 10–20 ng/ml as mild deficiency and 5–10 ng/ml and < 5 ng/ml as moderate and severe deficiency states respectively.

RESULTS

Vitamin D levels were analyzed in 200 postmenopausal women. Mean age was 58 years with a range of 48–72 years. Mean duration since menopause was 8.7 years. Mean BMI was 24.3 kg/m^2 . Majority (82%) of women belonged to a low socioeconomic class and 87% were uneducated. Only 7% had regular intake of milk in their diet. Sixty five percent had a sedentary lifestyle with no or little weight bearing and muscle building exercises. Seventy five percent were housewives. Only two percent women knew about vitamin D, its sources and its importance. Nineteen percent had exposure to sun for more than 30 minutes on regular basis and 65% were consistently using burqa for pardah. Fifty three percent women had brown to dark complexion.

Table No.1: Characteristics of Postmenopausal women (n= 200)

Age(years)	Mean= 58
Time since menopause(years)	Mean=8.7
BMI(kg/m^2)	Mean= 24.3
Socioeconomic class	Low: n= 164
Education	Uneducated: n= 174
Lifestyle	Sedentary: n= 30
Occupation	Housewives: n= 150
Sun exposure(> 30 minutes daily)	n= 38
Complexion	Brown: n= 106

Mean Vitamin D levels were 14.7 ng/ml with a range of 4–62 ng/ml. Nineteen percent of women had adequate levels defined as more than 30 ng/ml. Twenty two percent had insufficient (20–30 ng/ml) levels. Vitamin D deficiency (levels below 20 ng/ml) was present in 112 (59%) of postmenopausal women. Out of 112 with vitamin D deficiency, 66 (33%) had mild deficiency (levels: 10–20 ng/ml) while 42 (21%) had moderate deficiency (5–10 ng/ml). Ten (5%) women were severely deficient with levels of vitamin D less than 5 ng/ml.

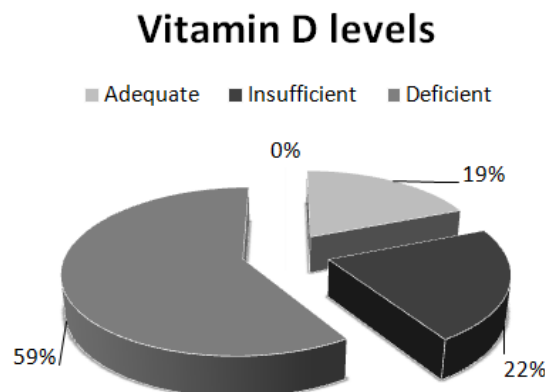


Figure No.1: Vitamin D levels in postmenopausal women

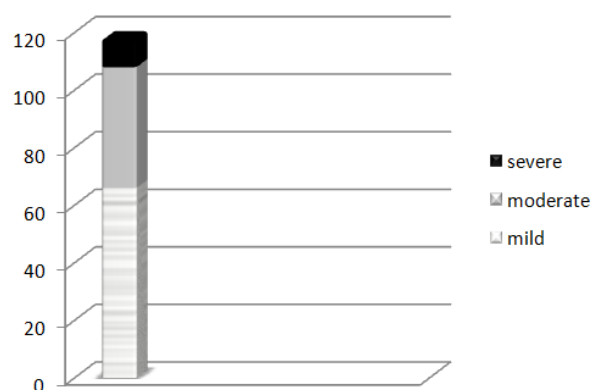


Figure No. 2: Categorization of Vitamin D deficiency in Postmenopausal women

DISCUSSION

Genetic factors exert a strong and perhaps predominant influence on peak bone mass, but physiological, environmental, and modifiable lifestyle factors can also play a significant role.¹² Among these are adequate nutrition and body weight, exposure to sex hormones, and physical activity.^{12,13} Vitamin D is required for optimal calcium absorption and thus is also important for bone health. Indeed, in patients who are vitamin D deficient, no more than 15 % of dietary calcium is absorbed, whereas in persons who are not vitamin D deficient 30 – 80% of dietary calcium is absorbed.^{13,14}

Decreased calcium leads to increased parathyroid secretion which causes increased bone resorption.¹⁵ There is strong evidence that physical activity early in life particularly high impact exercises contribute to higher peak bone mass.^{15,16}

The two main sources of vitamin D are food and sunlight.¹⁵ Generally natural food sources have low vitamin D content and therefore require fortification.¹⁶ Insufficient dietary supplies of vitamin D in countries where food stuffs are not fortified, leads to generally low dietary intake of vitamin D and calcium.^{16,17} Unlike many Western countries that have a vitamin D food fortification policy, Pakistan does not have a mandatory vitamin D fortification policy in place. Increased pigmentation due to which more prolonged exposure to sun is required, use of sun block, purdah observation and possibly the reason that women in general do not go outside the home may be responsible for vitamin D deficiency.

Postmenopausal women are at high risk of osteoporotic fractures. In our country women constitutes a vulnerable group for calcium and vitamin D deficiency. Right from the teenage their diet is deficient in these essential nutrients. Peak bone mass achieved is low. This is coupled with closely spaced pregnancies followed by lactation leading to further decrease in bone mass. The overall consequences are that, by the time a woman reaches her menopause her bones are almost worn out. Estrogen deficiency pertaining to postmenopausal state makes the situation further worse. Regular intake of tea rather than milk is another culprit. Women in this region of world are ignorant of nutrient values of different foods. They mostly consume diets rich in carbohydrates but deficient in vitamins.

Our study showed that majority of women were uneducated and belonged to a low socioeconomic class. They had no idea of sources of vitamin D and the importance of vitamin D in diet. We observed that majority of our subjects had only occasional or no intake of milk and daily sun exposure of less than 30 minutes. Furthermore more than half of the women were using burqa for pardah leading to inadequate sun exposure. Majority were housewives and leading a sedentary life with no concept of exercise.

Our observations reveal very high incidence of hypovitaminosis D among postmenopausal women. In Pakistan so far no study has been done to address this issue specifically in postmenopausal women. However studies done in different regions of Pakistan to assess the deficiency of vitamin D in general population showed that our population is deficient in vitamin D. Anjum P et al in their study reported a prevalence of vitamin D deficiency in 66.32 % of their study population.¹⁸ A similar study by H Khan et al¹⁹ showed that 56.2 % of females were deficient in vitamin D in Islamabad and only 10.5 % had adequate levels. Our results are close to these but our study comprised of

only postmenopausal women. Narula R et al²⁰ conducted a study in north India to assess vitamin D levels in postmenopausal women. Their study revealed vitamin D deficiency in 62 % of study subjects. Our results correlate with theirs.

Our study indicates very high prevalence of hypovitaminosis D among postmenopausal women. Prevention of vitamin D deficiency by appropriate diet, activity, sunlight exposure appears to be the primary prerequisite in maintaining adequate vitamin D levels. Food fortification with vitamin D at a national level should be implemented. Community should be educated about the importance of vitamin D.

CONCLUSION

Vitamin D deficiency has a high prevalence in postmenopausal women owing to their lack of knowledge, deficient diet, sedentary lifestyle and inadequate sun exposure. Vitamin D levels should be routinely checked in all postmenopausal women and vitamin D deficiency should be effectively treated. This will be helpful in reducing incidence of osteoporotic fractures among postmenopausal women.

REFERENCES

1. Bandeira F, Griz L, Dreyer P, Eufrázino C, Bandeira C, Freese E. Vitamin D deficiency: A global perspective. *Arq Bras Endocrinol Metabol* 2006;50(4):640-6.
2. Hollick MF, Vitamin D. the underappreciated D-lightful hormone that is important for skeletal and cellular health. *Curr Opin Endocr Diab* 2002;9: 87-98.
3. Holick MF. The vitamin D epidemic and its health consequences. *J Nutr* 2005;135(11):2739S-48S.
4. Holick MF. Vitamin D deficiency. *N Engl J Med* 2007;357:266-281.
5. Holick MF. High prevalence of vitamin D inadequacy and implications for health. *Mayo Clin Proc* 2006;81(3):353-73.
6. Holick MF, Siris ES, Binkley N, Beard MK, et al. Prevalence of Vitamin D Inadequacy among Postmenopausal North American Women Receiving Osteoporosis Therapy. *The J Clin Endocrinol & Metabol* 2005;90(6): 3215-3224.
7. Daly RM, Gagnon C, Lu ZX, Magliano DJ, et al. Prevalence of vitamin D deficiency and its determinants in Australian adults aged 25 years and older: a national, population-based study. *ClinEndocrinol (Oxf)*. 2012 Jul;77(1):26-35.
8. Cranney A, Horsley T, O'Donnell S, Weiler H, et al. Effectiveness and safety of vitamin D in relation to bone health. Evidence report/technology assessment 2007;(158):1-235.
9. Hart GR, Furniss JL, Laurie D, et al. Measurement of vitamin D status: background, clinical use and methodologies. *Clin Lab* 2006;52(7-8):335-343.

10. Kennel KA, Drake MT, Hurley DL. Vitamin D Deficiency in Adults: When to Test and How to Treat. *Mayo Clin Proc* 2010;85(8):752-758.
11. Aslam M, Masood Z, Sattar A, Qudsia M. Vitamin D Deficiency; Prevalence in Pregnant Women. *Prof Med J* 2012;19(2): 208-213.
12. Bischoff HA, Stahelin HB, Dick W, et al. Effects of vitamin D and calcium supplementation on falls: a randomized controlled trial. *J Bone Miner Res* 2003;18:343-351.
13. Khan AH, Iqbal R, Naureen G, Dar FJ, Ahmed FN. Prevalence of vitamin D deficiency and its correlates: results of a community-based study conducted in Karachi, Pakistan. *Arch Osteoporos* 2012;7(1-2):275-82.
14. Rucker D, Allan JA, Fick GH, Hanley DA. Vitamin D insufficiency in a population of healthy western Canadians. *CMAJ* 2002;166(12):1517-1524.
15. Atiq M, Suria A, Nizami SQ, Ahmed I. Maternal Vitamin D deficiency in Pakistan. *Acta Obstet Gynaecol Scand* 1998;77:970-3.
16. Lips P. Vitamin D deficiency and secondary hyperparathyroidism in the elderly: consequences for bone loss and fractures and therapeutic implications. *Endocr Rev* 2001;22(4):447-501.
17. Masood Z, Mahmood Q, Ashraf KT. Vitamin D Deficiency-An Emerging Public Health Problem in Pakistan. *JUMDC* 2010;1(1):4-9.
18. Anjum P, Safdar N, Khalid M, Mehboob I. Vitamin D deficiency in Pakistani Population. *J Pak Ortho Assoc* 2013;25 (1):18-19.
19. Khan H, Ansari MA, Waheed U, Farooq N. Prevalence of Vitamin D Deficiency in General Population of Islamabad, Pakistan. *Ann Pak Inst Med Sci* 2013;9(1):45-47.
20. Narula R, Tauseef M, Ahmad IA, Agarwal K, et al. Vitamin D Deficiency Among Postmenopausal Women with Osteoporosis. *J Clin Diagn Res* 2013; 7(2):336-338.

Address for Corresponding Author:

Dr. Shadab Akhtar

House No. 406, Street No.04 Sector F-9,
Phase- 6, Hayatabad, Peshawar,
Khyber Pukhtunkhwa.
Cell No. 0333-9286929
Email: doc_saa@yahoo.com

Corrigendum

The title of the article '**Increased Risk of Preterm Birth in Anemic Pregnants**' published in Med Forum Vol 24. No.11, available at pages 58-59, has been printed wrongly as has been printed wrongly as '**Increased Risk of Preterm Labour in Younger Pregnant Females**' which may be read as follows:

'Increased Risk of Preterm Birth in Anemic Pregnant Females'

Secondly the name of second author in the subject article may also be read as **Nusrat Manzoor** instead of Nusrat Javed.

Azhar Masud Bhatti,
Editor in Chief