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Research Article

EFFECT OF MENOPAUSE AND LIFESTYLE FACTORS ON SERUM VITAMIN D STATUS IN POSTMENOPAUSAL WOMEN

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ABSTRACT

Objectives: The study was designed to determine the effect of menopause and lifestyle factors on Serum Vitamin D levels in postmenopausal women.

Methods: The present study comprises 100 healthy women treated as controls and was compared to 200 postmenopausal women as cases. Those fulfilling inclusion and exclusion criteria were enrolled for the study and blood samples were analyzed for Vitamin D and Estrogen.

Results: Significant lower concentration of Vitamin D ($p<0.001$) and estrogen ($p<0.001$) was found in postmenopausal women when compared with healthy women.

Conclusion: Vitamin D is a steroid hormone known for its essential role in maintaining calcium homeostasis, promoting and maintaining bone health, and improving immune function. During the menopausal stages, there is a gradual reduction in estrogen levels this decline in estrogen production promotes Vitamin D deficiency.

Keywords: Vitamin D, Estrogen, Postmenopausal women, Lifestyle factors.

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INTRODUCTION

Vitamin D is a lipophilic vitamin required for maintaining the homeostasis of calcium and phosphorous. The deficiency of Vitamin D is a public health problem as it has a high worldwide prevalence and it might contribute to a variety of acute and chronic diseases. Vitamin D is obtained through contact to ultraviolet B (UVB) sunlight as well as nutritious sources. Exogenously consumed and endogenously synthesized vitamers are converted in the liver to 25-hydroxyvitamin D [25(OH)D]. [25(OH)D] is a major circulatory form and is a widely used biomarker of Vitamin D nutritional status [1]. In the kidney, the (25(OH) D) gets converted enzymatically by 1α-hydroxylase to biologically active 1,25 dihydroxy Vitamin D [$1,25(OH)_2D$] [2]. All metabolic functions related to Vitamin D are mediated by the action of $1,25(OH)_2D$ and Vitamin D receptors (VDR) through gene modulation in target tissues [3].

Menopause, the cessation of the menstrual cycle caused by reduced secretions of estrogen and progesterone, is defined as 1 year without menses, occurring between the ages of 45–55 [4]. Estrogen increases the activity of 1-α-hydroxylase (expressed in the kidneys) responsible for the activation of Vitamin D and upregulates the VDR [5]. During the menopausal stages, there is a gradual reduction in the amount of estrogen produced by the ovaries [6]; this decline in estrogen production promotes vitamin D deficiency. The resultant Vitamin D challenge is related to a decrease in the number of VDR [5,7,8].

Apart from maintaining calcium homeostasis, Vitamin D also plays an important role in a variety of non-calcemic diseases such as infections, cancer, autoimmune and neurological diseases. Postmenopausal women are at a higher peril for several chronic diseases due to the loss of estrogen [9]. The reduction of estrogen increases the risk of breast cancer and cardiovascular disease (CVD) due to changes in body composition (increased abdominal fat) and blood lipids [10]. Calcium is a vital mineral the body uses to build strong bones and teeth; it also takes part in many biochemical pathways. Its loss in menopause causes serious health challenge-osteoporosis. Menopausal osteoporosis occurs after the cessation of estrogen production by the ovaries. Furthermore, postmenopausal women have a higher prevalence of bone fractures and falls [11] due to Vitamin D deficiency because low Vitamin D has been linked to bone demineralization [12]. This study is therefore carried out to evaluate the Effect of Menopause on Serum Vitamin D and Hormonal status in postmenopausal women as well as the influence of lifestyle habits on the development of Vitamin D deficiency.

METHODS

The present study was undertaken in the Department of Medical Biochemistry, LN Medical College, and Research Centre Bhopal (M.P.). The study group comprises 200 Postmenopausal women treated as Cases and 100 Healthy women matched for age were treated as controls.

Inclusion criteria

Postmenopausal women; aged between 45 and 64 years with a history of cessation of menses for at least 12 consecutive months, were included in the study.

Exclusion criteria

Women who did not sign the consent form; women on medication that may affect the results; women suffering from serious chronic diseases (cancer, renal failure, etc.); and women using hormone replacement therapy were excluded from the study.

Blood sampling was performed in the morning, following a not less than 12 h fasting period. 5 ml of blood (venous) samples were taken under aseptic conditions in sterile tubes from the normal healthy controls and the postmenopausal women. Biochemical parameters analyzed were Vitamin D and estrogen. The Institutional Ethics Committee granted ethical approval. All the data were computed and analyzed using statistical packages for social science software version 20. Values are presented as Mean±SD. $p<0.001$ is considered highly significant and $p<0.05$ is considered significant. Anonymity and confidentiality were respected.

RESULTS

Table 1 shows the anthropometric parameters of the study participants. Table 2 shows the Sociodemographic and lifestyle characteristics of study participants. Table 3 shows the Values of Vitamin D, and Estrogen levels between normal healthy women and Post-Menopausal Women. It is evident from Table 3 that the mean values of Vitamin D and Estrogen were found to be significantly lower in postmenopausal women when compared with the control subjects. The difference in values of Vitamin D and estrogen in the study group and controls was found to be highly significant (p<0.001).

DISCUSSION

Vitamin D is a steroid hormone recognized for its essential role in upholding calcium homeostasis, promoting and maintaining bone health, and improving immune function [13,14]. Postmenopausal women have a high prevalence of diseases with relevance for Vitamin D, such as musculoskeletal diseases as well as changes in Vitamin D metabolism, due to reduced skin synthesis of Vitamin D, or changes in body composition that are relevant for Vitamin D status and physiology. Vitamin D plays an important role in bone growth and maintenance by enhancing intestinal absorption of calcium and influencing bone metabolism in other ways. Aging in females and the subsequent drop in estrogen levels are thus associated with a decline in Vitamin D levels. About 95% of estrogen is secreted by the ovaries in women before menopause. After menopause, all the estrogens in females are derived from adrenal androgens, such that estrogen levels in postmenopausal women are less than those of premenopausal women. Aging is directly linked to decreasing Vitamin D levels. The diminishing levels of Vitamin D with age is due to impaired intestinal absorption of Vitamin D [15] as well as a decline in the concentration of Vitamin D precursors normally stored in the skin coupled with reduced capacity to synthesize Vitamin D in the skin when exposed to UVB radiation [16]. In addition, the decline in estrogen associated with postmenopausal women decreases the activity of 1-alpha hydroxylase Vitamin D responsible for activating Vitamin D and its receptors (VDRs). This finding was in accord with the reports of Kalra *et al*. [17], Harinarayan *et al*. [18], Pearce and Cheetham [19], Joshi *et al*. [20], Group [21], Akhtar and Jan [22], Capatina *et al*. [23], and Narula *et al*. [24].

Table 1: Anthropometric parameters in normal healthy women and the postmenopausal women

Variables	Healthy women	Postmenopausal women
Age	55±8.5	56±7.5
BMI	21.95±1.95	28.2±3.86
Waist circumference	77±6.5	89.4±10.52

BMI: Body mass index

Table 2: Sociodemographic and lifestyle characteristics of study participants

	Employment status		Alcohol intake		Diabetes Mellitus	
	Employed	Unemployed	Yes	No	Yes	No
Healthy women	52	48	8	92	0	100
Postmenopausal women	92	108	4	196	116	84

Table 3: Values of Vitamin D, and estrogen level between normal healthy women and postmenopausal women

Variables	Healthy women	Postmenopausal women	p value
Vitamin D (ng/mL)	47.89±12.76	15.61±6.98	p<0.001
Estrogen (pg/mL)	74.20±17.85	22.03±8.54	p<0.001

In this study, we found that body mass index (BMI) is significantly high in postmenopausal women when compared with healthy women. High BMI is associated with low Vitamin D levels. Vitamin D is stored in adipose tissue and is sequestered in the pool of fat. This causes a low circulating level of Vitamin D in the body. The results of the present study are as per the work of Snijder *et al*. [25], Holick [26], and Wortsman *et al*. [27].

In this study, we also found that unemployment could lead to financial insecurities as such resulting in poorer nutritional choices which may be an additional factor for Vitamin D deficiency.

CONCLUSION

Vitamin D deficiency is an alarming problem among postmenopausal women which is implicated as a contributing factor to muscle weakness and falls and it is important to treat Vitamin D deficiency to prevent falls and fractures. Poor Vitamin D status has been associated with the increased risk of many ailments such as metabolic syndrome, CVD, diabetes, and infectious diseases. The interplay between sunlight exposure, lifestyle habits, and serum Vitamin D levels cannot be ignored. Encouraging women to adhere to healthy lifestyles, and eat a balanced diet will help in maintaining normal Vitamin D levels. Exposure to sunlight and indulging in outdoor recreational activities can help achieve optimum Vitamin D levels. Keeping this in mind, equally important is losing weight to maintaining desired Vitamin D level. Treatment of Vitamin D deficiency with supplementation is essential to prevent deficiency in whom Vitamin D through dietary sources and sunlight exposure is not sufficient.

AUTHORS' CONTRIBUTIONS

Farha Ali was involved in the study's design and coordination, as well as helped to draft the manuscript and Maninder bindra was involved in doing the statistical analysis and writing the manuscript. All the authors have read and approved the final manuscript.

CONFLICTS OF INTEREST

There are no conflicts of interest among any of the authors of this paper.

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