SJIF Impact Factor: 6.711

WORLD JOURNAL OF ADVANCE HEALTHCARE RESEARCH

ISSN: 2457-0400
Volume: 8.
Issue: 10
Page N. 112-116
Year: 2024

Original Article www.wjahr.com

NUTRITIONAL ASSESSMENT OF VITAMIN D AND CHOLESTEROL LEVELS IN HOUSEWIVES

Bhavani K.[1], Lally Hanna Luke[2*] and Deepa C. Philip[3]

[1]Post Graduate Student, Department of Clinical Nutrition, MMM College of Health Sciences, Mogappair, Chennai, India.
[2]Associate Professor, Department of Clinical Nutrition, MMM College of Health Sciences, Mogappair, Chennai, India.
[3]Principal, MMM College of Health Sciences, Mogappair, Chennai, India.

Article Received date: 15 August 2024 **Article Revised date:** 02 Sept. 2024 **Article Accepted date:** 22 Sept. 2024

***Corresponding Author: Lally Hanna Luke**
Associate Professor, Department of Clinical Nutrition, MMM College of Health Sciences, Mogappair, Chennai, India.

ABSTRACT
Vitamin D deficiency is increasingly prevalent among housewives aged 25 and above, primarily due to reduced sun exposure and possibly elevated cholesterol levels. This deficiency has been linked to dyslipidemia, and housewives, who often have limited physical activity and sun exposure, face a heightened risk of both obesity and vitamin D deficiency. In this study, 30 housewives were assessed for blood serum levels of cholesterol, triglycerides, high-density lipoprotein (HDL), low-density lipoprotein (LDL), very low-density lipoprotein (VLDL), cholesterol-to-HDL ratio, and vitamin D. Following a one-month dietary intervention that included vitamin D-rich foods such as eggs, mushrooms, and cod liver oil, along with a recommended increase in physical activity, the participants' serum cholesterol and vitamin D levels were re-evaluated. Statistical analysis revealed no significant changes in total cholesterol, triglycerides, LDL, VLDL, or vitamin D levels. However, there was a significant improvement in HDL levels and the cholesterol-to-HDL ratio. The findings underscore the importance of sun exposure and physical activity in preventing vitamin D deficiency and obesity, which are significant risk factors for various co morbidities.

KEYWORDS: Vitamin D deficiency, cholesterol, physical activity, sun exposure, dyslipidemia.

INTRODUCTION
Vitamin D, a fat-soluble vitamin, plays a critical role in maintaining calcium homeostasis and promoting skeletal integrity, while also influencing immune regulation, apoptosis, and cardiovascular health.[1] Despite its importance, vitamin D deficiency has become increasingly prevalent worldwide, especially among housewives over the age of 25, due to limited sun exposure, dietary insufficiencies, and sedentary lifestyles. This deficiency is often associated with several co-morbidities, including dyslipidemia, obesity, and cardiovascular diseases. Cholesterol, a lipophilic molecule essential for the synthesis of vitamin D, steroid, and sex hormones, is also involved in the absorption of fat-soluble vitamins like A, D, E, and K.[2] However, elevated cholesterol levels, particularly in the form of low-density lipoprotein (LDL), are linked to atherosclerosis, which can lead to serious cardiovascular conditions.

The relationship between vitamin D and cholesterol is complex. Vitamin D influences lipid metabolism by reducing triglyceride synthesis and facilitating the conversion of cholesterol into bile acids, which may lead to improved lipid profiles.[3,4] Conversely, vitamin D deficiency is frequently observed in individuals with obesity, owing to factors such as decreased sunlight exposure, impaired intestinal absorption, and the sequestration of vitamin D in adipose tissue. This bidirectional relationship underscores the importance of addressing both vitamin D deficiency and dyslipidemia, particularly in populations like housewives, who may have limited access to outdoor activities and face additional health risks.[5,6]

This study aims to evaluate the vitamin D status and cholesterol levels among housewives and assess the effectiveness of a nutritional intervention plan. By providing a cyclic menu rich in vitamin D and promoting physical activity, this research seeks to explore the impact of dietary changes on improving lipid profiles and vitamin D levels in this vulnerable population. The specific objectives of the study include assessing vitamin D and cholesterol levels before and after the intervention, thereby contributing valuable insights into the role of nutrition in managing vitamin D deficiency and dyslipidemia.

MATERIALS AND METHODS

The study was designed to explore the nutritional assessment of vitamin D and cholesterol levels among housewives, with a particular focus on the implications of limited sun exposure and sedentary lifestyles, which are common in this demographic. Recognizing that vitamin D deficiency can lead to severe health complications, including osteomalacia, rheumatoid arthritis, and obesity, the study aimed to evaluate the vitamin D status and cholesterol levels of housewives, implement a targeted nutritional intervention through a cyclic menu plan, and subsequently reassess these levels. To achieve these objectives, an interventional study design was adopted, utilizing convenient sampling to select participants from Lakeside View Apartments, Chennai. The sample size calculation initially suggested 131 participants, but after considering various exclusion criteria such as unwillingness to participate, employment status, pregnancy, age, and health conditions, the final sample size was reduced to 30 housewives aged between 21 and 55 years.

Data collection was carried out using a structured questionnaire and interview schedule, covering a comprehensive range of topics including demographic data, anthropometric measurements (height, weight, BMI, waist circumference), medical history, biochemical assessments (vitamin D levels via ELISA, lipid profiles including total cholesterol, LDL, HDL, triglycerides, and VLDL), and dietary habits. The dietary assessment employed both a Food Frequency Questionnaire (FFQ) and a 24-hour recall method to obtain detailed insights into the participants' dietary intake patterns. Following the initial assessment, nutrition education sessions were conducted to emphasize the importance of sun exposure, physical activity, and dietary modifications. A structured diet plan was designed for both vegetarian and non-vegetarian housewives, tailored to meet their nutritional needs. The diet emphasized vitamin D-rich foods, such as mushrooms, maize, ragi, and sun-dried tomatoes, as well as cholesterol-lowering foods like legumes, nuts, and fatty fish. The goal was to enhance vitamin D levels while supporting overall health and well-being.

RESULTS

Anthropometric Measurements of the Selected Samples

Table 1

Anthropometric Measurement	Mean	S.D
Height(cm)	158.76	6.54
Weight(kg)	67.75	8.69
BMI (kg/m^2)	26.99	2.90
Waist Circumference (cm)	83.83	6.78

Table 1 presents a summary of the anthropometric measurements of the study participants. The average height was 158.76 cm [±6.54], and the mean weight was 67.75 kg [±8.69]. The participants had an average BMI of 26.99 [±2.90], with a mean waist circumference of 83.83 cm [±6.78]. The participants fall into the pre-obesity group with a BMI of 26.99 according to WHO guidelines.

Comparison of total cholesterol, triglycerides, HDL, LDL, VLDL, cholesterol-HDL ratio, and vitamin D levels before and after following a cyclic menu plan.

TABLE 2

Total Cholesterol (mg/dl)	**Mean**	**S.D**	**p-value**
Before	190.43	33.84	0106, N.S
After	185.03	32.67	
Triglycerides (mg/dl)			
Before	103.60	32.67	0.052, N.S
After	96.27	34.90	
HDL(mg/dl)			
Before	43.60	3.83	0.05, **S***
After	45.04	3.43	
Low Density Lipoprotein(mg/dl)			
Before	126.10	32.75	0.387, N.S
After	123.13	31.27	
VLDL(mg/dl)			
Before	20.73	6.45	0.538, N.S
After	22.22	12.41	
CHOLESTEROL-HDL Ratio			
Before	4.44	1.16	**0.01, S***

After	4.12	0.89	
Vitamin – D (ng/ml)			
Before	25.65	10.37	0.429, N.S
After	27.52	12.02	

Table 2 illustrates the comparison of total cholesterol, triglycerides, HDL, LDL, VLDL, cholesterol-HDL ratio, and vitamin D levels before and after following a cyclic menu plan.

The mean total cholesterol before the cyclic menu was 190.43 mg/dl, which reduced to 185.03 mg/dl after the intervention, with a mean difference of 5.50 mg/dl. However, this reduction was not statistically significant.

The mean triglyceride level decreased from 103.60 mg/dl before the cyclic menu to 96.27 mg/dl after, with a mean difference of 7.33 mg/dl. This change was not statistically significant.

The mean HDL level increased from 43.60 mg/dl before the cyclic menu to 45.04 mg/dl after, with a mean difference of 1.44 mg/dl. This increase was statistically significant ($p < 0.05$). A study by Alkhatatbeh, M.J., et al. (2018) found that individuals with sufficient vitamin D levels had higher HDL cholesterol levels compared to those with insufficient vitamin D, aligning with the findings of the current study.

The mean LDL level slightly decreased from 126.10 mg/dl to 123.13 mg/dl after the cyclic menu, with a mean difference of 2.97 mg/dl. This change was not statistically significant. According to a study by Manish P. Ponda et al. (2012), short-term vitamin D correction does not significantly impact lipid profile values, which is consistent with the findings of this study.

The mean VLDL level increased slightly from 20.73 mg/dl to 22.22 mg/dl, with a mean difference of 1.49 mg/dl, though this change was not statistically significant.

The mean cholesterol-HDL ratio decreased from 4.44 before the cyclic menu to 4.12 after, with a mean difference of 0.32. This reduction was statistically significant ($p < 0.01$), indicating an improvement in cardiovascular risk.

The mean vitamin D level increased from 25.65 ng/ml before the cyclic menu to 27.52 ng/ml after, with a mean difference of 1.87 ng/ml. This change was not statistically significant.

In summary, the cyclic menu plan significantly improved HDL levels and the cholesterol-HDL ratio but did not show a significant effect on total cholesterol, triglycerides, LDL, VLDL, or vitamin D levels. The findings align with previous studies, particularly in regard to the limited short-term impact of vitamin D on lipid profiles.

24-HOUR DIETARY RECALL OF THE SELECTED SAMPLES
TABLE 3

24 Hours dietary recall	Mean	S. D	RDA
Energy	1223.98	194.57	1600 kcals
Protein	43.16	9.01	36.3 g
CHO	168.78	33.08	100 g
Fat	30.32	7.27	20 g

Table 3 depicts the mean of energy, protein, carbohydrates, and fat on a 24-hour dietary recall. The mean energy intake was 1223.96 kcals. The mean protein intake was 43.16 g. The mean carbohydrates were 168.78 g. The mean fat intake was 30.32 g.

According to ICMR 2020, the recommended dietary allowance of energy, protein, carbohydrates, and fat for sedentary women was 1660 kcal, 36.3 g, 100 g, and 20 g, respectively. In comparison with the mean values of the selected samples, the energy requirements were not met, whereas the protein, carbohydrates, and fat were met above the recommended levels.

Since the fat intake was high when compared with RDA and due to less physical activity, it may lead to high cholesterol levels and low vitamin D levels in women.

CONCLUSION

This study aimed to assess the nutritional status of vitamin D and cholesterol levels among housewives. The findings revealed that the participants generally exhibited slightly low vitamin D levels and fell within the pre-obese category. Following a nutritional intervention, which included education on a vitamin D-rich diet, physical activity, and increased sun exposure, there was a slight improvement in high-density lipoprotein (HDL) levels and the cholesterol-HDL ratio. Given the widespread issues of vitamin D deficiency and obesity, both of which are linked to several co morbidities, it is crucial for housewives to engage in regular sun exposure and physical activity to mitigate these risks.[(7.8)] Additionally, incorporating vitamin D-rich foods into the diet and maintaining overall nutritional balance can help improve lipid profiles and reduce the likelihood of chronic health conditions.

Housewives should aim for at least 45 minutes of daily physical activity and regular sun exposure.- The diet should include vitamin D-rich foods such as sun-dried tomatoes, mushrooms, fatty fish, and organ meats like liver.- Vitamin D supplementation can be considered under medical supervision.- Sunscreen use should be limited to necessary situations to allow for adequate sun exposure and vitamin D synthesis.

If the study were extended over a longer period with the inclusion of calcium and vitamin D supplementation, more significant changes in lipid profiles may be observed. Further research is encouraged to explore the long-term effects of such interventions.

Compliance with ethical standards

ACKNOWLEDGMENTS

Our profound gratitude .We sincerely appreciates all research participants' effort and unflinching patience.

Disclosure of conflict to interest

No conflict to interest was declared by the authors.

Statement of ethical approval

Compliance with ethical standards

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

REFERENCES

1. Aparna P, Muthathal S, Nongkynrih B, & amp; Gupta S K, "Vitamin D deficiency in India". Journal of family medicine and primary care, 2018; 7(2): 324–330.
2. Dawson-Hughes B, Wang J, Barger K, & Ceglia L, "Effects of Vitamin D with Calcium and Associations of Mean 25-Hydroxyvitamin D Levels with 3-Year Change in MusclePerformance in Healthy Older Adults in the Boston STOP IT Trial", Calcified tissue international, 2022; 111(6): 580–586.
3. Destiana D, & Timan I, "The relationship between hypercholesterolemia as a risk factor for stroke and blood viscosity measured using Digital Microcapillary", Journal of Physics: Conference Series, 2018; 1073: 042045.
4. Dominguez L J, Farruggia M, Veronese N, & Barbagallo M, "Vitamin D Sources, Metabolism, and Deficiency: Available Compounds and Guidelines for Its Treatment", Metabolites, 2021; 11(4): 255.
5. Gellert S, Ströhle A, Bitterlich N, & amp; Hahn A, "Higher prevalence of vitamin D deficiency in German pregnant women compared to non-pregnant women", Archives of Gynecology and Obstetrics, 2017; 296.
6. Giustina A, Adler R A, Binkley N, Bouillon R, Ebeling P R, Lazaretti-Castro M, Marcocci C, Rizzoli R, Sempos, C T, & amp; Bilezikian J P, "Controversies in Vitamin D: Summary Statement from an International Conference", The Journal of clinical endocrinology and metabolism, 2019; 104(2): 234–240.
7. Iraj B, Ebneshahidi A, & amp; Askari G, "Vitamin d deficiency, prevention and treatment", International journal of preventive medicine, 2012; 3(10): 733–736.
8. Kennel K A, Drake M T, & amp; Hurley D L. "Vitamin D deficiency in adults: when to test and how to treat", Mayo Clinic proceedings, 2010; 85(8): 752–758.
9. Lamberg-Allardt C, "Vitamin D in foods and as supplements", Progress in biophysics and molecular biology, 2006; 92(1): 33–38.
10. Lee, Chan & amp; Park, Sanghyun & amp; Han, Kyungdo & amp; Lee, Sang. (2022). Impact of Severe Hypercholesterolemia on Cardiovascular Risk in Individuals with or Without Diabetes Mellitus. Journal of Lipid and Atherosclerosis, 11. 299. 10.12997/jla.2022.11.3.299.
11. Lofters A K, Guilcher S J, Webster L, Glazier R H, Jaglal S B, & amp; Bayoumi A M "Cholesterol testing among men and women with disability: the role of morbidity". Clinical epidemiology, 2016; 8: 313–321.
12. Lopez A G, Kerlan V, & amp; Desailloud R, "Non-classical effects of vitamin D: Non-bone effects of vitamin D", Annales d' endocrinologie, 2021; 82(1): 43–51.
13. MacDonald T, "Prevalence of High Cholesterol Among the Adult U.S. Population": NHANES 2013–2018. Current Developments in Nutrition, 2022; 6(Suppl 1): 925.
14. Menet R, Bernard M, & amp; ElAli A, "Hyperlipidemia in Stroke Pathobiology and Therapy: Insights and Perspectives". Frontiers in physiology, 2018; 9: 488.
15. Migliaccio S, Di Nisio A, Mele C, Scappaticcio L, Savastano S, Colao A, & amp; "Obesity Programs of nutrition, Education, Research and Assessment (OPERA) Group Obesity and hypovitaminosis D: causality or casualty?" International journal of obesity supplements, 2019; 9(1): 20–31.
16. Nagy C D, & amp; Kwiterovich P O, "CHAPTER 12 - Evaluation and Management of Dyslipidemia in Children and Adolescents", In R S Blumenthal, J M Foody, & amp; N D Wong (Eds.), "Preventive Cardiology: Companion to Braunwald's Heart Disease", 2011; 183–203.
17. Pérez-López F R, Pasupuleti V, Mezones-Holguin E, Benites-Zapata V A, Thota P, Deshpande A, & amp; Hernandez A V, "Effect of vitamin D supplementation during pregnancy on maternal and neonatal outcomes: a systematic review and meta-analysis of randomized controlled trials", Fertility and sterility, 2015; 103(5): 1278–88.
18. Ravinder S S, Padmavathi R, Maheshkumar K, Mohankumar M, Maruthy K N, Sankar S, & amp; Balakrishnan K, "Prevalence of vitamin D

deficiency among South Indian pregnantwomen", Journal of family medicine and primary care, 2022; 11(6): 2884–2889.
19. Rosen C J, Adams J S, Bikle D D, Black D M, Demay M B, Manson J E, Murad M H, & amp; Kovacs C S, "The non skeletal effects of vitamin D: an Endocrine Society scientificstatement", Endocrine reviews, 2012; 33(3): 456–492.