Original Article

Cigarette Smoking and Serum Level of Vitamin D among Older Adults

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Abstract

Background: Vitamin D has different biological actions in the body. Vitamin D has pleiotropic effects in multiple organ systems. Vitamin D deficiency has been found to have an inverse relationship with tobacco smoking. **Objective:** The objective of this study was to identify the prevalence of Vitamin D level and its correlates with tobacco smoking among old adults in Al-Hilla city, Babylon Province. **Methods:** A cross-sectional study was conducted on a sample of old adults, both males and females, who were selected from dwellers in community of Al-Hilla city, Babylon Province, Iraq, during the period from January to August 2019. A pretested questionnaire was used for data collection adopted from previous standard national surveys and studies, and the questionnaire included information about sociodemographic characteristics and cigarette smoking habit. **Results:** The study included 300 participants, and most of them had either insufficiency or deficiency of Vitamin D level (84%). Tobacco cigarette smoking elders had a significantly low serum Vitamin D level (both deficiency and insufficiency) as compared to the nonsmoker group ($P < 0.05$). **Conclusion:** There was a significant inverse relationship between Vitamin D level and tobacco cigarette smoking.

Keywords: Iraq, old adults, tobacco smoking, Vitamin D levels

Introduction

Lifestyles that may influence serum Vitamin D concentrations have not been well examined. Specifically, the association of smoking with serum Vitamin D concentrations was unclear. Most of the recent studies reported lower serum Vitamin D in current smokers than in never smokers.[1-5] Although the prevalence of smoking has been decreasing in the developed countries in recent years, the less developed countries, including Iraq, are facing an impact from smoking prevalence rise.[6] The absolute number of people aged 65 years and older is expected to double in the next two decades in all world regions.[7] The proportion of U.S. adults who smoke cigarettes declined from 20.9% in 2005 (45.1 million smokers) to 15.5% in 2016 (37.8 million smokers). Sociodemographic disparities in cigarette smoking persist.[8] Vitamin D plays a physiological role and its concentrations is important for the functioning of the metabolic, immune, and respiratory systems of both genders and in all ages.[9,10] Unhealthy habits may influence serum Vitamin D concentrations which have not been well studied. The association of smoking with serum Vitamin D concentrations was unclear, and many published articles clarified lower serum Vitamin D among tobacco smokers than nonsmokers.[11-14] Studies in adults have reported that tobacco smoke exposure decreases the serum concentrations of both parathyroid hormone and Vitamin D.[5,14-18]

This study was conducted to identify the relationship between cigarette tobacco smoking and serum Vitamin D level among Iraqi elderly people.

Materials and Methods

A descriptive cross-sectional epidemiological study was conducted on old adults of both males and females (65 years

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and more) who were selected from dwellers in community of Al-Hilla city, Babylon Province, Iraq, during the period from January to August 2019.

The study protocol was revised and approved by the Scientific Committee of the University of Babylon/College of Nursing/Family and Community Health Nursing. The sample size was calculated according to the sample size calculation equation with 95% confidence level; 300 elderly people were participated voluntarily in this study, and all of them agreed to participate after explaining the objective of the study by the researcher (the response rate: 100%).

A pretested questionnaire was used for data collection which was adopted from previous standard national surveys and studies. The questionnaire included information about sociodemographic characteristics and cigarette smoking habit: nonsmokers (those who never smoked cigarette), smokers (those who smoke cigarettes at the time of interview or those who used to smoke within the last 6 months from the time of the study), and ex-smokers (those participants who quitted smoking for at least 6 months and above).[19] The serum level of Vitamin D was measured by chemoimmunoassay method (maglumi instrument).

Ethical consideration

The study was conducted according to the ethical principles that have their origin in the Declaration of Helsinki. Verbal informed consent was obtained from each participant enrolled in this study. The protocol of the study and the participant information and consent form were reviewed and approved by a local ethics committee.

Results

Table 1 shows the distribution of elders according to their age. Results found that the mean age of the study groups was 65–69-year group which is the dominant age group. The overall mean age and the standard deviation are 70.96 ± 5.34.

Table 2 and Figure 1 show the frequency distribution of the study participants according to the means of Vitamin D level by gender; the mean of Vitamin D level among females is lower than Vitamin D level among males.

Figure 2 explains the distribution of the elders according to the age group, most of the participants in the age group of 65–69 years (66%).

Tables 3 and 4 show the frequency distribution of the number of cigarettes smoked per day by the study participants and frequency distribution of the duration of smoking per year, respectively.

Table 5 shows that the majority of smokers (92.3%) have deficiency or insufficiency; this table also explains a positive highly significant association between duration of smoker years and level of Vitamin D among old adults, and there is an inverse relationship between the two variables.

Table 6 shows that 17% of elderly males and females are current smokers.

Table 7 indicates that 84% of old males and females have low serum Vitamin D level (less than 30 ng/ml), most of them with deficient level; this table also explains a positive highly significant association between low Vitamin D and having high cigarette uses among old adults, and there is an inverse relationship between the two variables (increased cigarette smoking and declined Vitamin D level).

Table 8 explains a strong association between serum Vitamin D level 12 (18.8) and smoking habits among elderly peoples.

Table 1: Frequency distribution of the mean age of the study group

Age group (year)	*n* (%)	Mean age (years)	SD
65-69 years	168 (56)	67	67.39±1.38
70-74 years	84 (28)	73	72.19±1.30
75 and more	48 (16)	78	81.31±3.83
Total	300 (100)		70.96±5.34

SD: Standard deviation

Table 2: Means of Vitamin D level according to gender

Gender	Mean of Vitamin D level (ng/ml)
Females	19.5
Males	25.8
Males and females	22.5

Discussion

The findings of this study depict that the prevalence of low Vitamin D serum level is higher among elderly men compared to women. The proportion of participants with insufficient and deficient Vitamin D in this study is high, and this high prevalence is similar to that reported by other researchers.[13] Our study is in line with several recent studies showing current smoking to be associated with Vitamin D deficiency or lower serum Vitamin D concentrations[20-28] and provided complementary information on the dose–response pattern. Recently, Soldin *et al.* found an adverse effect of smoking on the synthesis of steroid hormones, including Vitamin D.[29]

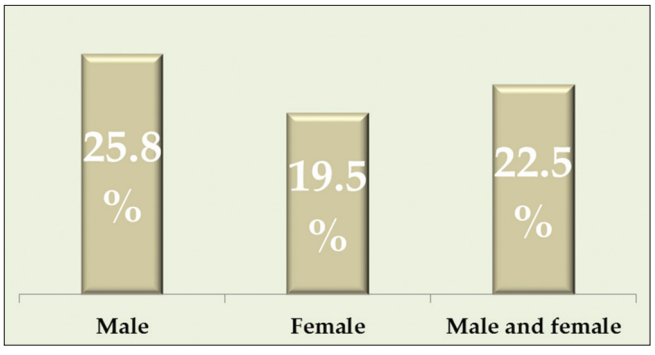

Figure 1: Means of Vitamin D level by gender

The exact mechanisms by which smoking affects Vitamin D metabolisms are still unclear. One possibility is that current smokers had a lower Vitamin D dietary pattern than never smokers, which may, partly, if at all, explain the negative association of smoking and Vitamin D in our study. The other possible explanation is that chemicals in tobacco smoke may have a direct effect on Vitamin D metabolism and function.[30]

Moreover, there is evidence that smoking may change the expression of some genes that play a role in the metabolic pathway of Vitamin D.[5,14,16-18,20,31] These findings in adults were, however, not replicated in a nationwide study of 2515 children and adolescents of 10–18 years old in South Korea which found no relationship between urinary cotinine-verified prevalence of smoking and Vitamin D deficiency.[20,32]

Studies in adults have reported that tobacco smoke exposure decreases the serum concentrations of both parathyroid hormone and Vitamin D leading to poor absorption of calcium from the gastrointestinal tract and an acceleration of bone loss.[33] Overall low Vitamin D was seen in 79.33% of the population. Low Vitamin D levels were seen in 75.47% of males and 81.39% of females. Smoking is an independent risk factor which has detrimental effect on metabolism of calcium and Vitamin D. The depression Vitamin D PTH

Table 3: Frequency distribution of the number of cigarettes smoked per day by the study participants

Number of cigarettes per day	*n* (%)
1-20	31 (59.6)
21-40	11 (21.4)
41-60	7 (13.3)
>60	3 (5.7)
Total	52 (100)

Table 4: Frequency distribution of the duration of smoking (years)

Duration of smoking (years)	*n* (%)
0-9	9 (17.5)
10-19	9 (17.5)
20-29	13 (23)
30 years and more	21 (40)
Total	52 (100)

Table 5: Association between smokers in study according to duration of smoking among males and females and level of Vitamin D

Study variables	Level of Vitamin D among males and females			Total, *n* (%)
	Deficiency, *n* (%)	Insufficient, *n* (%)	Normal, *n* (%)	
Duration of smoker years				
0-9	3 (10.8)	3 (15)	3 (75)	9 (17.5)
10-19	4 (14.2)	4 (20)	1 (25)	9 (17.5)
20-29 and more	7 (25)	6 (30)	0 (0)	13 (25)
30 and more	14 (50)	7 (35)	0 (0)	21 (40)
Total, *n* (%)	28 (100)	20 (100)	4 (100)	52 (100)

χ^2=57.99, df=6, P<0.001

Table 6: Frequency distribution of smoking status by age among males and females

Age (years)	Smoking status (*n*=300)			
	Nonsmoker, *n* (%)	Current smokers, *n* (%)	Ex-smokers, *n* (%)	Total, *n* (%)
65-69 years	183 (77.5)	28 (53.8)	5 (41.6)	216 (72)
70-74 years	42 (17.7)	20 (38.4)	5 (41.6)	67 (22.4)
75 and more	11 (4.8)	4 (7.8)	2 (16.8)	17 (5.6)
Total, *n* (100%)	236 (100)	52 (100)	12 (100)	300

52/300=17% smokers calculated χ^2=57.99, df=4, P<0.002

Table 7: Association between Vitamin D level and smoking habit and among both genders

Study variables	Vitamin D level status (*n*=300)			Total, *n* (%)
	Deficiency (0-20 ng/ml), *n* (%)	Insufficiency (21-29 ng/ml), *n* (%)	Normal (30-100 ng/ml), *n* (%)	
Smoking tobacco				
Current smokers	28 (12.9)	20 (55.7)	4 (8.4)	52 (17.3)
Ex-smokers	5 (2.4)	5 (13.8)	2 (4.1)	12 (4)
Nonsmokers	183 (84.7)	11 (30.5)	42 (87.5)	236 (78.7)
Total, *n* (%)	216 (100)	36 (100)	48 (100)	300

52/300=17.3% smokers 216+36=252/300=84% deficiency or insufficient χ^2=57.99, df=4, P<0.001

Table 8: Association between Vitamin D level and smoking habit among 64 male and female smokers and ex-smokers

Study variables	Vitamin D level status ($n=64$)			Total, *n* (%)	χ^2	*P*
	Deficiency (0-20 ng/ml), *n* (%)	Insufficiency (21-29 ng/ml), *n* (%)	Normal (30-100 ng/ml), *n* (%)			
Smoking habit						
Current smokers	28 (82.4)	20 (80)	4 (80)	52 (81.2)	57.99	<0.001
Ex-smokers	6 (17.6)	5 (20)	1 (20)	12 (18.8)		
Total, *n* (%)	34 (100)	25 (100)	5 (100)	64 (100)		

28+20=48/52=92.3% deficiency or insufficiency of Vitamin D among current smokers and 6+5=11/12=91.6% deficiency or insufficiency of Vitamin D among ex-smokers, df=2

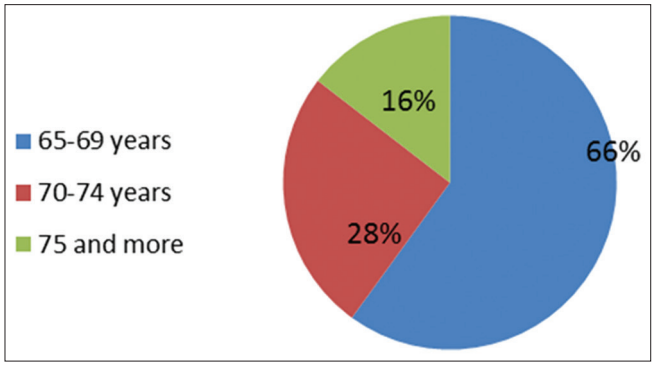

Figure 2: Frequency distribution of the study group by age

axis is seen in chronic smokers which eventually affects the bone metabolism and contributes to the increased risk of osteoporosis and fractures.[20] In this study, the mean Vitamin D level in smokers was 32.2 ng/ml which was lower than nonsmokers (41.8 ng/ml) [Figure 2]. In this study, hypovitaminosis was seen in 86.2% of elderly patients.

Conclusion

This study explains that tobacco smoke exposure is an independent predictor of Vitamin D deficiency among elderly people in Hilla city.

Limitations

There are several limitations in the current study. First, this was a cross-sectional study. Whether smoking reduces Vitamin D or if there is an association between smoking and Vitamin D levels could not be confirmed due to residual confounding. Given the unquestionable harmful effects of tobacco smoke, no measurements of urinary cotinine levels were done. Unfortunately, however, we were unable to evaluate nutrition as part of this study. Additional studies are required, therefore, to assess the longitudinal duration of exposure smoking and dietary intake for evaluating the cause–effect relationship between tobacco smoke exposure and Vitamin D low level (deficiency and insufficiency) in elders.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Shinkov A, Borissova AM, Dakovska L, Vlahov J, Kassabova L, Svinarov D. Winter 25-hydroxyvitamin D levels in young urban adults are affected by smoking, body mass index and educational level. Eur J Clin Nutr 2015;69:355-60.
2. Kassi EN, Stavropoulos S, Kokkoris P, Galanos A, Moutsatsou P, Dimas C, *et al*. Smoking is a significant determinant of low serum vitamin D in young and middle-aged healthy males. Hormones (Athens) 2015;14:245-50.
3. Colao A, Muscogiuri G, Rubino M, Vuolo L, Pivonello C, Sabatino P, *et al*. Hypovitaminosis D in adolescents living in the land of sun is correlated with incorrect life style: A survey study in Campania region. Endocrine 2015;49:521-7.
4. Lange NE, Sparrow D, Vokonas P, Litonjua AA. Vitamin D deficiency, smoking, and lung function in the Normative Aging Study. Am J Respir Crit Care Med 2012;186:616-21.
5. Cutillas-Marco E, Fuertes-Prosper A, Grant WB, Morales-Suárez-Varela M. Vitamin D deficiency in South Europe: Effect of smoking and aging. Photodermatol Photoimmunol Photomed 2012;28:159-61.
6. Al-Murshedi RK, Baiee HA. Smoking and its correlates among secondary school students in Al-Hilla City 2018. Med J Babylon 2018;15:326-33.
7. United Nations, Department of Economic and Social Affairs, Population Division. World Population Prospects; 2015.
8. Tiwari P, Sharma N. Role of Vitamin D in various illnesses: A review. J Pharm Care Health Syst 2017;4:3.
9. Jamal A, Phillips E, Gentzke AS, Homa DM, Babb SD, King BA, *et al*. Current cigarette smoking among adults United States, 2016. MMWR Morb Mortal Wkly Rep 2018;67:53-9.
10. Hollis BW, Wagner CL. Clinical review: The role of the parent compound Vitamin D with respect to metabolism and function: Why clinical dose intervals can affect clinical outcomes. J Clin Endocrinol Metab 2013;98:4619-28.
11. Tiwari P, Sharma N. Role of Vitamin D in various illnesses: A review. J Pharm Care Health Syst 2017;4:3.
12. Assari S, Smith JL, Zimmerman MA, Bazargan M. Cigarette smoking among economically disadvantaged African-American older adults in South Los angeles: Gender differences. Int J Environ Res Public Health 2019;16:1208.
13. Jiang CQ, Chan YH, Xu L, Jin YL, Zhu T, Zhang WS, *et al*. Smoking and serum Vitamin D in older Chinese people: Cross-sectional analysis based on the Guangzhou Biobank Cohort Study. BMJ Open 2016;6:e010946.
14. Banihosseini SZ, Baheiraei A, Shirzad N, Heshmat R, Mohsenifar A. The effect of cigarette smoke exposure on Vitamin D level and biochemical parameters of mothers and neonates. J Diabetes Metab Disord 2013;12:19.
15. Sharma N, Sharma B, Singh G, Gupta A, Sharma R, Kapil U. Vitamin D status in cold trans-Himalayan deserts at altitude of 4000 meter and above in India. Indian J Community Health 2018;30:400-42.
16. Hermann AP, Brot C, Gram J, Kolthoff N, Mosekilde L. Premenopausal smoking and bone density in 2015 perimenopausal women. J Bone Miner Res 2000;15:780-7.

17. Díaz-Gómez NM, Mendoza C, González-González NL, Barroso F, Jiménez-Sosa A, Domenech E, *et al*. Maternal smoking and the Vitamin D-parathyroid hormone system during the perinatal period. J Pediatr 2007;151:618-23.
18. Manavi KR, Alston-Mills BP, Thompson MP, Allen JC. Effect of serum cotinine on vitamin D serum concentrations among american females with different ethnic backgrounds. Anticancer Res 2015;35:1211-8.
19. Yaseen SM, Ahmed SK. prospective study of upper gastro intestinal tract endoscopy findings and its relation to smoking in Baquba Teaching Hospital. Diyala J Med 2015;8:46-54.
20. Moon JH, Kong MH, Kim HJ. Effect of Secondhand Smoking, Determined by Urinary Cotinine Level on Bone Health. Int J Prev Med 2018;9:14.
21. Methodology. The European School Survey Project on Alcohol and Other Drugs; 2015. Available from: http://espad.org/sites/espad.org/files/TD0116477ENN_002.pdf. [Last accessed on 2018 Jul 11].
22. Engine S, Rivera-collazo I, Piedras R, Rico P, States U. Youth Smoking Survey 2010/2011; 2010. Available from: https://uwaterloo.ca/canadian-student-tobacco-alcohol-drugs-survey/201011-yss-mod. [Last accessed on 2018 Jul 12].
23. GSHS. Global School-Based Student Health Survey (GSHS) Purpose and Methodology: 2013 Core Questionnaire Modules. World Health Organization Chronicle Diseases Health Promot; 2013.
24. Florida Department of Children and Families. 2016 Florida Youth Substance Abuse Survey; 2016. p. 154.
25. Anjum MS, Srikanth M, Reddy PP, Monica M, Rao KY, Sheetal A. Reasons for smoking among the teenagers of age 1417 years in Vikarabad town: A cross-sectional study. J Indian Assoc Public Health Dent 2016;14:80.
26. Brot C, Jorgensen NR, Sorensen OH. The influence of smoking on Vitamin D status and calcium metabolism. Eur J Clin Nutr 1999;53:920-6.
27. Supervía A, Nogués X, Enjuanes A, Vila J, Mellibovsky L, Serrano S, *et al*. Effect of smoking and smoking cessation on bone mass, bone remodeling, Vitamin D, PTH and sex hormones. J Musculoskelet Neuronal Interact 2006;6:234-41.
28. Shi L, Nechuta S, Gao YT, Zheng Y, Dorjgochoo T, Wu J, *et al*. Correlates of 25-hydroxyvitamin D among Chinese breast cancer patients. PLoS One 2014;9:e86467.
29. Kühn T, Kaaks R, Teucher B, Hirche F, Dierkes J, Weikert C, *et al*. Dietary, lifestyle, and genetic determinants of Vitamin D status: A cross-sectional analysis from the European Prospective Investigation into Cancer and Nutrition (EPIC)-Germany study. Eur J Nutr 2014;53:731-41.
30. Soldin OP, Makambi KH, Soldin SJ, O'Mara DM. Steroid hormone levels associated with passive and active smoking. Steroids 2011;76:653-9.
31. O'Shaughnessy PJ, Monteiro A, Bhattacharya S, Fowler PA. Maternal smoking and fetal sex significantly affect metabolic enzyme expression in the human fetal liver. J Clin Endocrinol Metab 2011;96:2851-60.
32. Byun EJ, Heo J, Cho SH, Lee JD, Kim HS. Suboptimal Vitamin D status in Korean adolescents: A nationwide study on its prevalence, risk factors including cotinine-verified smoking status and association with atopic dermatitis and asthma. BMJ Open 2017;7:e016409.
33. Pathak SK, Maheshwari P, Ughareja P, Shah S, Prashanth Raj M Gour SK. Is Vitamin D deficiency a modern epidemic in tropical countries? Int J Orthop Sci 2017;3:568-71.