RESEARCH PAPER

Comparative Study of Vitamin D With Various Categories of Physical Activity Among Medical Students

Bhagyashree N[1*], Shilpasree Jana[2], Sai Sailesh Kumar Goothy[3],
[1]Professor, Department of Physiology,*
Adichunchanagiri Institute of Medical Sciences, Adichunchanagiri University, B G Nagara, Karnataka.
Email: bhagyashivanugraha@gmail.com
[2]Junior resident, Department of Radiation Oncology,
NEIGRIHMS Shillong.
[3]Professor, Department of Physiology,
BGS Medical College and Hospital, Adichunchanagiri University,
Vijnanatham South Campus, Nagarur, Bengaluru.

ABSTRACT
Physical activity refers to any body movements that result in expenditure of energy and it can be of indoors and outdoors. Physical activity can increase serum vitamin D, by causing lipolysis and mobilization of stored vitamin D from the fat compartments. MBBS students with the age of 17-22 years of both sexes were recruited and the participants were asked to give the physical activity related information in International physical activity questionnaire – short form. Blood sample was collected to measure serum vitamin D levels. Association between low, moderate and high levels of physical activity with individuals doing indoor and outdoor activities showed statistically significant difference ($p = 0.01$). Serum vitamin D level showed statistically significant difference in people who were doing outdoor activities when compared with those who were doing indoor activities ($p = 0.01$). Since vitamin D deficiency is associated with many diseases, vitamin D assessment should be considered at national level among different age groups to improve the condition.

Key words: Vitamin D, physical activity, questionnaire, outdoor, Indoor
How To Cite This Article: Bhagyashree N, Jana S, Goothy Ssk. Comparative Study Of Vitamin D With Various Categories Of Physical Activity Among Medical Students. Int J Drug Deliv Technol. 2026;16(26s):818-822. Doi: 10.25258/ijddt.16.26s.87

INTRODUCTION

Vitamin D helps to control serum calcium level, as soon as it is absorbed form the intestine, assisting in bone metabolism regulation1. Vitamin D3 is synthesized in the skin from 7–dehydrocholesterol with the exposure to sunlight. About 80% to 90% of the vitamin D requirements are produced by the skin and remaining is obtained by the dietary food or supplements2. Blood level of vitamin D is influenced by a number of factors in humans3 such as exposure to sunlight, diet, supplementation of vitamin D, and gastrointestinal, hepatic and renal diseases are some of the well-documented factors2.

Deficiency of vitamin D has become a worldwide health problem4,5. Researchers have shown that mortality rate is high in people with deficiency of vitamin D because of cardiovascular diseases, diabetes, cancer, miscarriage and infertility6.

Physical activity refers to any body movements that result in expenditure of energy7 and it can be of indoors and outdoors1. Outdoor physical activity is physical activity performed at public parks or other open spaces. It would have advantages of physical activity as well as exposure to sun for synthesis of vitamin D1. Decreased physical activity leads to obesity which is also associated with decreased serum vitamin D levels. Physical activity can increase serum vitamin D, by causing lipolysis and mobilization of stored vitamin D from the fat compartments8. Hence, the objective of the study was to assess physical activity using International Physical Activity Questionnaire (IPAQ) – short form and to compare various categories of physical activity with vitamin D levels among medical students.

MATERIALS AND METHODS

Comparative study was conducted among phase I and phase II MBBS students having the age of 17-22 years of both sexes and they were recruited to the study based on random sampling. Willingness to participate in the study was obtained in the form of written informed consent. Basic details from the voluntary participants were collected. Then, students were asked to fill the International Physical Activity Questionnaire – Short Form (IPAQ – SF) which gives information on the time spent as physically active and measures vigorous physical activity, moderate physical activity, question regarding walking and also time spent by sitting on week days during last seven days. Based on the categorical scoring, physical activity is classified as low, moderate and high.

Permission from Ethics committee of the Institution was taken before beginning the study. Blood sample of about 2 ml was obtained from all the participants to measure serum vitamin D levels using ELISA methods.

Healthy participants were included and those who reported

any infection or health problem and those who are taking vitamin D as treatment for the last 6 months were not included to participate in the study.

RESULT

Table 1: Physical activity parameters of the study population (values expressed in Mean ± SD)

Category	Mean	SD
a. Score		
Low	45.91	32.13
Moderate	43.88	29.31
High	55.77	26.20
b. Indoor/outdoor		
Indoor	40.43	27.45
Outdoor	54.23	32.03
Not applicable	41.71	31.10
c. Season		
Summer	48.06	30.60
Winter	38.05	35.79
Both summer and winter	48.00	30.87
Not applicable	41.14	29.55
d. Duration		
Half an hour	42.76	28.78
One hour	41.93	27.62
More than one hour	62.77	31.78
Two hours	55.33	43.21
Not Applicable	40.63	30.87
e. Time		
Morning	43.13	29.46
Evening	47.73	30.78
Morning and Evening	78	----
Not Applicable	42.37	31.38

Table 2: Association between levels of physical activity with individuals doing indoor and outdoor physical activity

Physical activity levels	Indoor	Outdoor	Not Applicable	Percentage	Fisher Exact test p value
Low	32	25	41	98	
Moderate	29	32	18	79	**0.011***
High	3	4	0	7	

Table 3: Comparison of vitamin D with physical activity

Physical activity	Median (25^{th} perc, 75^{th} perc)	Df	Chi sq	p value#	Indoor Vs outdoor P value##	Indoor Vs Not applicable P value##	Outdoor Vs Not applicable P value##
Indoor	36.5 (15.425, 56.0)						
Outdoor	52.0 (29.0 , 75.0)	2	7.2887	**0.026***	**0.015***	0.903	**0.028***
Not Applicable	30.0 (14.8 , 73.0)						

P value# - Kruskal Wallis test, P value## - Mann Whitney U test.

Table 4: Comparison of vitamin D in various seasons, timings and different categories of physical activity

Season	Median (25^{th} perc, 75^{th} perc)	DF	Chi-sq	P value
Both summer & winter	42.36 (22, 70)	3	3.5872	0.30
Summer	52 (27, 68)			
Winter	25.4 (10.4, 56)			
Not Applicable	30 (15.2, 67)			

Timing				
Evening	40 (23, 67)	3	2.9307	0.40
Morning	35.50 (15, 56)			
Morning vs Evening	78 (- -)			
Not Applicable	29.5 (15.1, 74)			
Categories of physical activity				
High	68 (29, 78)	2	1.3085	0.51
Low	36.5 (18, 67)			
Moderate	39 (16, 67)			

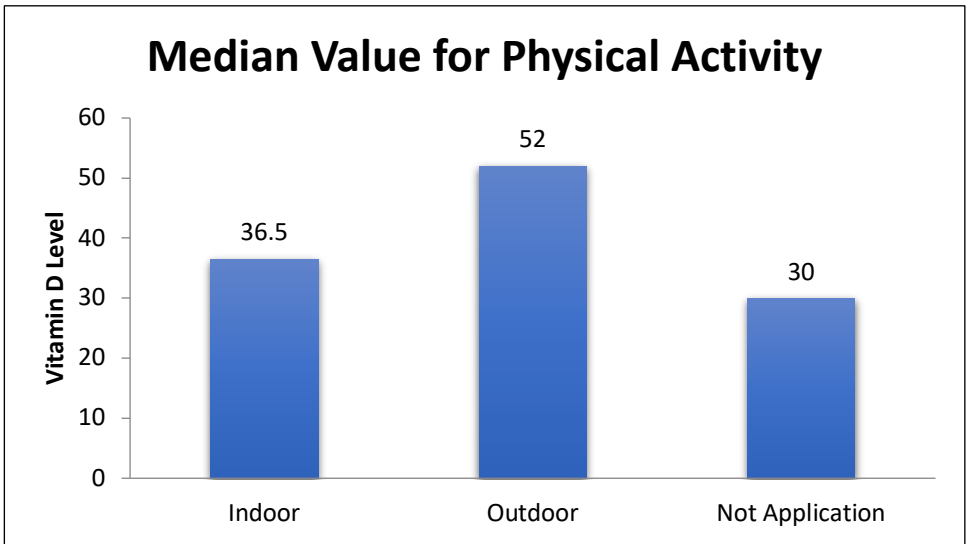

Figure 1: Comparison of vitamin D with physical activity (table 7): p = 0.02: n = 184

The various parameters of physical activity included in the present study such as score, place (indoor/outdoor) season, duration and time were depicted in table 1. The analysis of the values of table 1 showed that the mean value of low, moderate and high levels of physical activity was found to be 45.91±32.13, 43.88±29.31 and 55.77±26.20 respectively. Among the participants, the values of individuals doing indoor and outdoor physical activity were 40.43±27.45 and 54.23±32.03 respectively and 41.71±31.1 students fail to mention their physical activity. The table 1(c) showed the individuals doing physical activity in various seasons which indicated that the mean of participants doing their physical activity in summer, winter and both in summer as well as winter were found to be 48.06±30.60, 38.05±35.79 and 48.00±30.87 respectively. There were 41.14±29.55 participants who did not do any physical activity irrespective of season. Similarly, the duration spent by the individuals in doing physical activity per day was mentioned (Table 1(d)). The result showed that the average value of participants doing physical activity for half an hour, one hour, more than one hour and two hours was 42.76± 28.78, 41.93±27.62, 62.77±31.78 and 55.33±43.21 respectively. The part of the day at which participants were doing their physical activity is shown in table 1(e). Result revealed that the average of individuals doing physical activity during morning, evening and morning as well as evening was found to be 43.13±29.46, 47.73±30.78 and 78 respectively. Some of the participants did not mention about duration and timing of their physical activity.

The present study also analyzed (table 2) the association between low, moderate and high levels of physical activity with individuals doing indoor and outdoor activities, which showed statistically significant difference (p = 0.01). Here, 33% (32/98) of individuals preferred doing low levels of indoor activities, 26% (25/98) of people were doing low levels of outdoor activities, whereas 42% (41/98) of people without exercise didn't bother about outdoor or indoor activities. Also, individuals who preferred doing moderate levels of indoor, outdoor activities were found to be 37% and 74% respectively. And 23% of people didn't care about indoor or outdoor activities. Similarly, participants who preferred doing high levels of indoor and outdoor activities were about 43% and 57% respectively.

Table 3 showed the comparison of vitamin D with indoor and outdoor physical activities. Here, median value of people who were doing outdoor activities were higher (52) when compared with those who were doing indoor (36.5) and without exercise (30) who didn't bother about indoor or outdoor. Serum vitamin D level showed statistically significant difference in people who were doing outdoor activities when compared with those who were doing indoor activities (p = 0.01) and also it showed statistically significant value in individuals doing outdoor activities when compared with those who were not doing exercise (p

= 0.02), but vitamin D level did not show any significant difference (p = 0.9) between those who were doing indoor activities and without exercise.

Comparison of vitamin D in various seasons, timings and different categories of physical activity is depicted in table 4. Here, vitamin D was not found to be statistically significant in various seasons, timings and different categories of physical activity.

Discussion:

Based on the categorical scoring obtained from the questionnaire, the type of physical activity undergone by the participants was classified as low, moderate and high (table 1). Apart from that, various other physical activity parameters obtained from the participants were also mentioned in table 1.

Further, the present study analyzed the association between levels of physical activity with individuals doing indoor and outdoor physical activity (table 2) and also comparison of vitamin D levels between indoor and outdoor activities has been done (table 3). The result showed that vitamin D levels were higher in individuals doing outdoor activities, which are in consistent with the result of previous studies. Exposure to sun is the most important factor which determines vitamin D levels, but age and the pigmentation of skin will alter the synthesis of vitamin D by sun9. It has been mentioned in the literature that outdoor physical activities increase vitamin D synthesis because of exposure to sunlight. Outdoor activities increase body vitamin D levels through sun-induced synthesis of vitamin D. Thus the previous studies have shown a positive association between physical activity, in general, and vitamin D status10 reported that the relationship between outdoor activities and vitamin D clearly suggests that risk of chronic diseases can be decreased by physical activity which is due to the increased levels of vitamin D because of outdoor activities, as evidenced by epidemiological studies that deficiency of vitamin D causes various diseases like diabetes, heart disease, cancer11.

The present study showed that levels of vitamin D were higher in summer in comparison with winter, though it was statistically insignificant may be in Chennai distinguish summer from winter is not very significant (table 4). Studies have shown that serum vitamin D levels were lower in winter season when compared with summer, which is in agreement with the result of present study12,13. Another study also has shown high vitamin D in summer and less in winter. Therefore, it has been said that indoor athletes are more prone to insufficiency of vitamin D especially in winter, which would affect the bone health14. Further longitudinal studies are required to clarify the mechanism involved in these circumstances.

Conclusion:

Since vitamin D deficiency is associated with many diseases, assessment of vitamin D should be considered at national level among different age groups, across various seasons to improve the condition. Awareness should be given to the public not only to reduce their body weight but also to normalize vitamin D levels and importance of healthy lifestyle by being physically active must be given..

REFERENCES

1. Fernandes M, Junior WRB. Association between physical activity and vitamin D: A narrative literature review. Rev Assoc Med Bras 2017; 63(6):550-556.
2. Holick MF. Vitamin D deficiency. N Engl J Med 2007; 357: 266 - 281.
3. Kumaratne M, Early G, and Cisneros J. Global Pediatric Health Vitamin D deficiency and association with body mass index and lipid levels in Hispanic American adolescents 2017; 4: 1 –6.
4. Bruggmann D,Alafi A, Jaque J, Klingelhöfer D, Bendels MH. World-wide research architecture of vitamin D research: density-equal-izing mapping studies and socio-economic analysis. Nutr J 2018; 17(1): 3.52.
5. Wang EW,Pang MY, Siu PM, Lai CK, Woo J. VitaminD status and cardiometabolic risk factors in young adult in Hong Kong: associations and implications. Asia Pac J Clin Nutr 2018; 27(1): 231.
6. Alsedairy S, Badr NA, Bekhaeit Z, Binobead M, Aldubaykhi H and Aljurbua T. Relationship between Vitamin D Status and Blood Pressure, Age, Physical Activity, and Nutritional Status in Saudi Males and Females. Novel Techniques in Nutrition and Food Science 2018 2(3); 1 – 11.
7. Bjorgen K. Physical activity in light of affordances in outdoor environments: qualitative observation studies of 3-5 years old in kindergarten. Springerplus 2016; 5(1): 950.
8. Kavadar G, Tekdos D, Demircioglu, Ozgonenel L, Emre TY. The relationship between vitamin D status, physical activity and insulin resistance in overweight and obese subjects. Bosn J Basic Med Sci 2015; 15(2): 62-66.
9. Scragg R and Camargo CA. Frequency of Leisure-Time Physical Activity and Serum 25-Hydroxyvitamin D Levels in the US Population: Results from the Third National Health and Nutrition Examination Survey. Am J Epidemiol 2008; 168: 577–586.
10. Eyre H, Kahn R, Robertson RM. Preventing cancer, cardiovascular disease, and diabetes. Diabetes Care 2004; 27: 1812–24.
11. Feskanich D, Ma J, Fuchs CS, et al. Plasma vitamin D metabolites and risk of colorectal cancer in women. Cancer Epidemiol Biomarkers Prev 2004; 13:1502–8.
12. Hoteit M, Al-Shaar L, Yazbeck C, Sleiman MB, Ghalayini T, Fuleihan GE. Hypovitaminosis D in a sunny country: time trends, predictors, and implications for practice guidelines. Metabolism 2014; 63(7): 968–978.
13. Al Hayek S, Mosleh JMB, Ghadieh R and Fares JEH. Vitamin D status and body composition: a cross-sectional study among employees at a private university in Lebanon. BMC Nutrition 2018; 4(31):1–11.
14. Ono Y, Suzuki A, Kotake M, Zhang X, Nishiwaki-Yasuda K, Ishiwata Y, Imamura S, Nagata M,

Takamoto S and Itoh M: Seasonal changes of serum 25-hydroxyvitamin D and intact parathyroid hormone levels in a normal Japanese population. J Bone Miner Metab 2005; 23: 147-151.