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Status of Vitamin D and Serum Calcium in Indoor and Outdoor Workers of Rural Population: Implication for General Health

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Abstract: ***This paper compares the levels of Vitamin D and serum Calcium in indoor and outdoor workers emphasizing the need of sufficient sunlight exposure in today's world where people spend most of the time in air conditioned rooms.***

Keywords: Vitamin D, Sunlight, Calcium, osteomalacia, Rickets

1. Introduction

Vitamin D is a fat soluble vitamin steroid prohormone responsible for enhancing intestinal absorption of calcium and phosphorus. Vitamin D, also known as 'the Sun Vitamin' is a steroid with hormone-like activity. Very few foods contain vitamin D. Dermal synthesis of vitamin D from cholesterol is dependent on sun exposure and is the major natural source of the vitamin. A diet deficient in vitamin D in conjunction with inadequate sun exposure causes osteomalacia or rickets when it occurs in children, which is a softening of the bones. (1,2) However, vitamin D deficiency has become a worldwide issue in the elderly and remains common in children and adults. (3, 4) Low blood calcidiol (25-hydroxy-vitamin D) can result from avoiding the sun. (5) Deficiency results in impaired bone mineralization and bone damage which leads to bone-softening disease, (7) including Osteomalacia. Due to modified life style, and more indoor activity, people are not aware of importance of sunlight for synthesis of vitamin D . Cholecalciferol is the active form of vitamin D ,hence sun exposure becomes an integral part of our life but due to changing life style and global warming adult as well as children there has been increase incident of patient presenting with complaint of easy fatigability and frequent body ache ,

The high prevalence of low vitamin D status is assumed to result from inadequate sun exposure. Sun exposed individuals are supposed to possess normal vitamin D status (Rucker et al, 2002). However some individuals with seemingly adequate sun exposure have been reported to have low vitamin D levels (Binkley et al, 2007). Vitamin D deficiency is suggested as a contributing factor in the development of several other diseases and conditions such as cardiovascular diseases, diabetes, some types of cancer and immunologic diseases, neurological disorders and depression (Horlick, 2005) Vitamin D plays a vital role in human body and its deficiency/insufficiency results in a number of disorders and diseases. It is of utmost importance to keep the vitamin D in the body at a desirable level for regular functioning of the body.

The most important modifiable risk factors for osteoporosis include the ones connected with lifestyle, among which the most important are dietary factors, factors associated with physical activity and the non-food source of vitamin D, which is skin synthesis through exposure to sunlight [8, 9].

An important endogenous source of vitamin D is regular exposure to the sun. However, it should be noted that commonly used sun blockers can reduce the yield of synthesis of skin under the influence of UVB radiation by up to 90% [10,11]. This study will aim at to measure the vitamin D along with calcium level in indoor and outdoor workers who are confined to the wall of their workplaces and to observe the co-relation in both the type of workers.

Objectives:

- To measure vitamin D level in indoor and outdoor workers
- To measure calcium level in indoor and outdoor workers
- To establish the relation between vitamin D and calcium level in the subject with their sun exposure.

2. Methodology

It is a prospective study. It will be carried out in the department of Biochemistry, JNMC and AVBR Hospital, Sawangi, Meghe Wardha. It will include total 60 subjects of age 30-70 year visiting to AVBRH, categorized into indoor workers (N=30) and outdoor workers (N=30). Written consent will be obtained from each subject.
Study excludes the subjects with chronic illnesses like diabetes mellitus, thyroid disorders, kidney disorders, etc. Study was conducted after the approval from IEC, DMIMS (DU).Written consent and detailed history including age, weight, height, BMI, gender, occupation, monthly income, duration of sun exposure, supplementation history and medical history was obtained from all the subjects.

Blood sample from each subject will be collected into plain bulbs. Vitamin D estimation will be done by Enzyme Linked Fluorescent Assay, and calcium estimation will be done by Arsenazo method on autoanalyzer. 30-100ng/ml

concentration of vitamin D was considered as a normal and acceptable range.

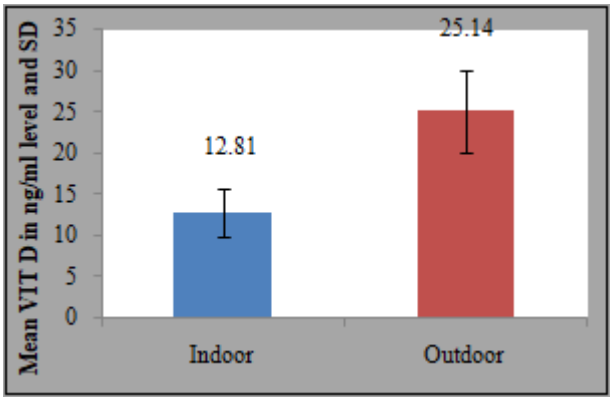
3. Results

Study included total 60 workers which were categorized into two groups, indoor worker group and outdoor worker group. Table 1 shows lower Vitamin D level as compared to outdoor activity group and it is statistically significant. Calcium level in the indoor group is also found on significantly lower side as compared to outdoor activity group (Table 2). Vitamin D and calcium level are not statistically correlated in indoor group while in outdoor group level of vitamin D and calcium are significantly correlated as shown in Graph 3.1,3.2

Statistical analysis was done by using descriptive and inferential statistics using student's unpaired t test and Pearson's correlation coefficient and software used in the analysis was SPSS 22.0 version and $p<0.05$ is considered as level of significance($p<0.05$).

Table 1: Comparison of Vitamin D level in two groups

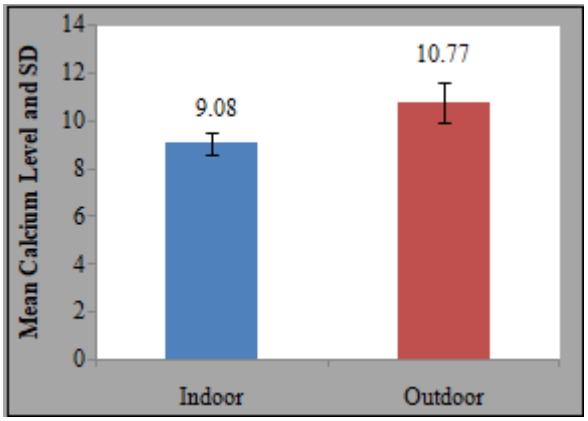
Group	N	Mean	Std. Deviation	Std. Error Mean	t-value
Indoor	30	12.81	3.01	0.55	11.49 P=0.0001,S
Outdoor	30	25.14	4.95	0.90	



Graph 1: Comparison of Vitamin D level in two groups

Table 2: Comparison of Calcium level in two groups

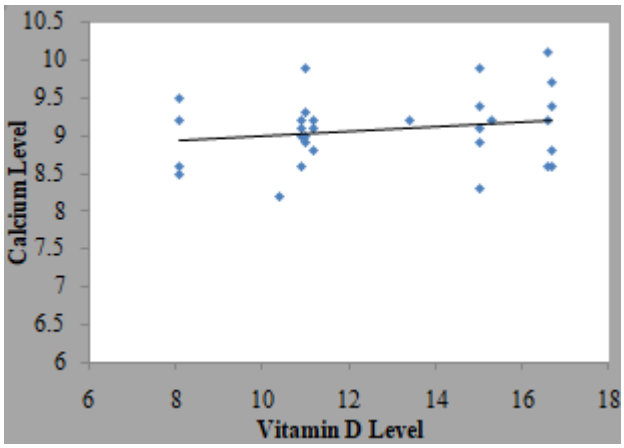
Group	N	Mean	Std. Deviation	Std. Error Mean	t-value
Indoor	30	9.08	0.46	0.08	9.52 P=0.0001,S
Outdoor	30	10.77	0.85	0.15	



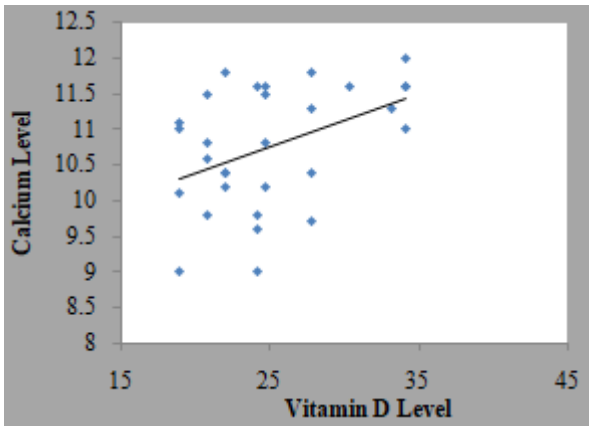
Graph 2: Comparison of Calcium level in two groups

Table 3: Correlation between Vitamin D level and calcium level in two groups

Group	N	Mean Vitamin D	Mean Calcium	Correlation	p-value
Indoor	30	12.81±3.01	9.08±0.46	0.202	0.282,NS
Outdoor	30	25.14±4.95	10.77±0.85	0.437	0.016,S



Graph 3.1: Correlation between Vitamin D level and calcium level in indoor group



Graph 3.2: Correlation between Vitamin D level and calcium level in outdoor group

4. Discussion

Vitamin D plays a vital role in human body and its insufficiency results in a number of disorders and diseases. It is important to keep the vitamin D in the body at a desirable level for regular functioning of the body. Results of the study shows that there is a insufficiency of the vitamin D in general population of Wardha district irrespective of age, gender, socio-economic status, sun exposure, and medical history.

Insufficient calcium intake is essential element in determining the importance of nutrition in the physiology and prevention of osteoporosis is.(12,13)

Vitamin D is essential for bone health. It promotes the efficient utilization of calcium by the body. Our study reported inadequate intake of calcium and vitamin D in the outdoor group Significant deficiency is even more disturbing because of the pleiotropic effects of vitamin which can protect the body against many chronic diseases including osteoporosis.

Hollis *et al*. found in their research that many people had insufficient levels of vitamin D level [14].

The human body is capable of endogenous synthesis of cholecalciferol of 7-dehydrocholesterol in the skin cells by ultraviolet radiation. Therefore, the efficiency of this process is dependent on skin pigmentation, age, time of exposure to sun and the latitude in which we live. Deficiency of vitamin D in the body can be caused by too low endogenous synthesis or by insufficient supply in the diet [15, 16]

Insufficient exposure to sunlight may be associated with fear of skin diseases including melanoma. It has been proven that excessive exposure to sunlight increases the risk of skin cancer, but there is no evidence that reasonable exposure to the sun increases this risk. Therefore, reasonable and recommended skin exposure to the sun should be perceived as the best source of vitamin D. (17)

5. Conclusion and Recommendations

Among the surveyed population the majority reported insufficient exposure to sunlight as a source of vitamin D additional to food. There is a need of health education for this population in the prevention of osteoporosis and especially paying attention toward intake of calcium and more vitamin D in their diet. At the same time, adequate exposure to the sun is vital as it is the main source of vitamin D.

UV rays exposure increasing rates of skin cancers, is an essential public-health message but some sun exposure is important for health, at the very least, to maintain healthful vitamin D levels. However it is highly recommended to take the Vitamin D3 supplements on a regular basis to overcome its deficiency we recommended that it should be included to the preventive program as a part of primary health care and to aware the public

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