

FREQUENCY OF VITAMIN D DEFICIENCY IN PATIENTS PRESENTING IN PUNJAB INSTITUTE OF CARDIOLOGY, LAHORE - DEFEATING THE DEFICIENCY OF THE SUNSHINE VITAMIN

Ambereen Anwar Imran^{a*}, Iman Imran^b, Sadaf Farzand^c, Abdul Wadood Khalid^c, Naima Mehdi^c, Mehfoozur Rehman^c, Qaisar Tauqeer Ahmed^c

^aAllama Iqbal Medical College / Jinnah Hospital, Lahore. ^bCMH Lahore Medical College, Lahore ^cPunjab Institute of Cardiology, Lahore.

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ABSTRACT:

BACKGROUND:

Vitamin D is a fat-soluble vitamin that plays an essential role in bone health as well as being involved in several other vital functions. These include maintenance of normal blood pressure, a healthy skin, as well as supporting the immune system in fight against infections and cancer. It has also been found to play role in psychological well being as well as preventing autoimmune diseases. Although it is synthesized in the skin in the presence of sunlight, an alarming proportion of world population suffers from outright vitamin D deficiency or has insufficient levels..

AIMS & OBJECTIVE:

To determine the frequency of vitamin D deficiency in patients presenting in Punjab Institute of Cardiology, Lahore.

MATERIAL & METHODS:

Vitamin D levels of 200 patients along with their demographic details were obtained from the records of Punjab Institute of Cardiology, Lahore. The results were analyzed by calculating the means, percentages and by applying student's t-test and other tests as appropriate.

RESULTS:

The mean levels of vitamin D was 23.97 ng/ml. Only 43 (21.5%) patients had adequate vitamin D levels, while 49 (24.5%) had levels in the insufficient range and 108 (54%) had vitamin D deficiency. The females had higher levels of vitamin D as compared to males. The highest levels were seen in females in 50-59 years age group.

CONCLUSION:

The levels of vitamin D were found to be alarmingly low in our population. The various factors involved are guessed to be air pollution, sociocultural practices and dress codes, darker skin tone of our population and use of sunblocks, obesity, overuse of glucocorticoids and other concurrent illnesses. Concerted efforts of healthcare providers and government are required to address the deficiency which may be the root cause of innumerable preventable diseases.

Correspondence : Ambereen Anwar Imran, Allama Iqbal Medical College / Jinnah Hospital, Lahore. Email: ambereen@outlook.com

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INTRODUCTION:

Vitamin D is a fat-soluble vitamin that plays an essential role in bone health as well as being involved in several other vital functions. These include maintenance of normal blood pressure, a healthy skin, as well as supporting the immune system in fight against infections and cancer. It has also been found to play role in psychological well being as well as preventing autoimmune diseases. It is especially important for pregnant women to have adequate levels of Vitamin D. There is evidence that the optimum functioning of over 200 genes is dependent on this vitamin.¹⁻³

The adequate serum levels of vitamin D have been described to be >30 ng/ml, with levels ranging from 20 to 29.9 ng/ml being termed insufficient and < 20 ng/ml as deficient.⁴

Keeping in view the many roles vitamin D plays in health, it is no surprise that its deficiency is manifested in numerous ways. Rickets, osteomalacia, osteoporosis and dental problems are the most obvious. People may experience bone and muscle pains. They may have an increased susceptibility to infections, like tuberculosis. Immune disorders like asthma and even autoimmune diseases have been linked to vitamin D deficiency. A myriad of disorders like diabetes, hypertension, depression, multiple sclerosis, Alzheimer disease, and psoriasis

are said to have vitamin D deficiency or insufficiency as a contributing factor.^{1-3,5}

Vitamin D deficiency is said to be rampant around the globe, surprisingly also in areas like Pakistan which get ample sunshine. Various studies have reported that only 15-20 percent of people in Pakistan have adequate vitamin D levels.⁶⁻⁸

Very few of these studies have included the population of Lahore. Here in we report some early findings regarding vitamin D levels in people residing in Lahore. We plan to collect and report more detailed results in future and this study was planned to determine the deficiency of vitamin D.

MATERIAL AND METHODS:

Vitamin D levels of 200 patients along with their demographic details were obtained from the records of Punjab Institute of Cardiology, Lahore. Sample size was calculated according to the formula:

$$\text{Sample size } n = \frac{[\text{DEFF} * Np(1-p)]}{[(d/2Z_{1-\alpha/2} * (N-1) + p * (1-p))]}$$

The expected frequency of vitamin D deficiency/insufficiency was taken as 85%.⁹ At a confidence level of 95% the sample size was calculated to be 196, which was rounded off to 200.

The results were analyzed by calculating the means, percentages and by applying student's t-test and other tests as appropriate.

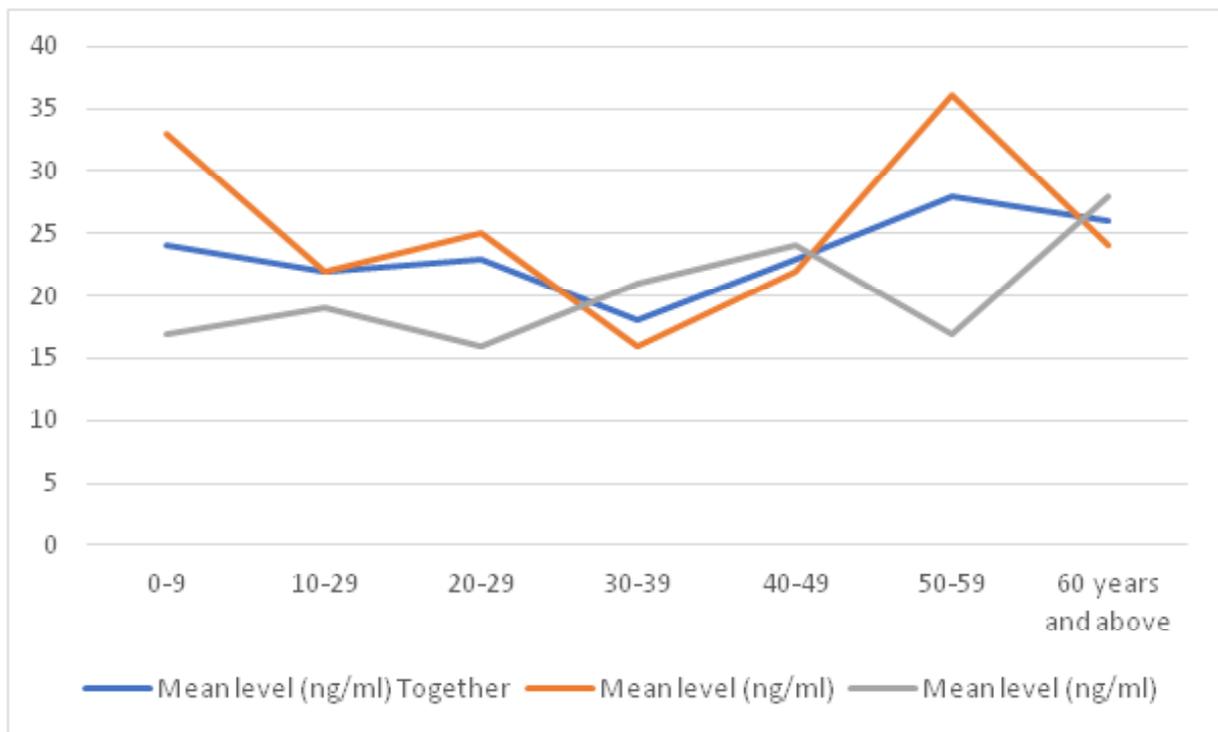


Figure-1: Line graphs showing the mean levels of Vitamin D in various age groups.

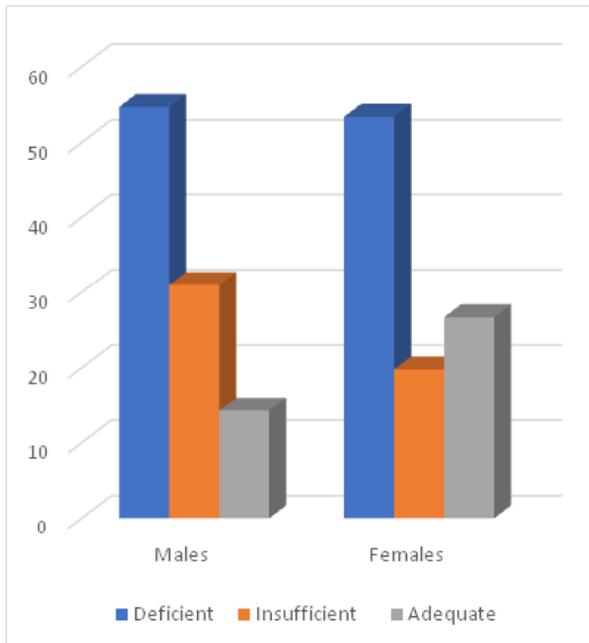


Figure-2: Bar chart showing percentages of males and females in deficient, insufficient and adequate groups.

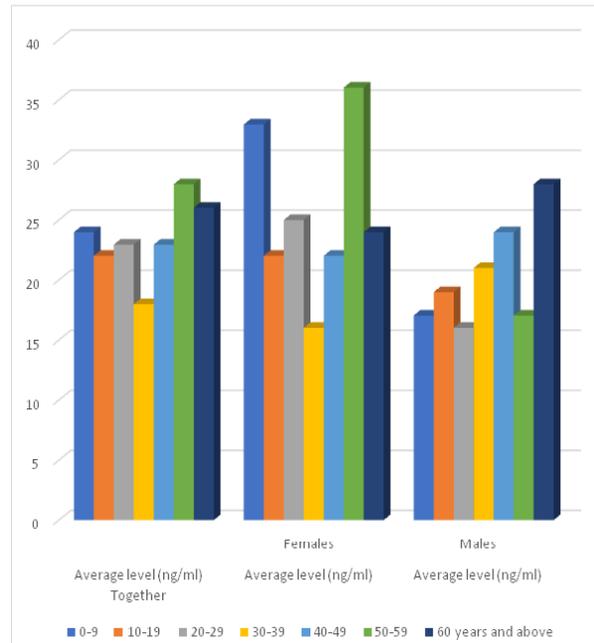


Figure-3: Bar chart depicting the average vitamin D levels in different age groups.

RESULTS:

A total of 200 patients who got their Vitamin D levels checked were included in the study. This included 84 males and 116 females. The male to female ratio was 1:1.38. There was a wide age range with the youngest patient being 1 year 2 months old while the eldest was 86 years old.

The mean levels of vitamin D was 23.97 ng/ml in the group. The mean level for males was 20.28±4.06 ng/ml, while that for females was 25.42±6.36 ng/ml (Figure 1). All of these fell in the insufficient level group.

Only 43 (21.5%) patients had adequate vitamin D levels, while 49 (24.5%) had levels in the insufficient range and 108 (54%) had vitamin D deficiency. The breakdown of male and female groups is given in Figure 2.

Figure 3 depicts the mean vitamin D levels in different age groups.

The females had higher levels of vitamin D as compared to males. The difference was analyzed by student’s t-test. The p-value was < 0.0001 indicating a high degree of significance. The lowest levels were seen in the 20-29 years age group in males and 30-39 years age group in females. The value for both these groups was 16ng/ml. The highest levels were seen in females in 50-59 years age group. The mean level in this age group was 36.44 ng/ml (Figure 3).

DISCUSSION:

Vitamin D, also known as the sunshine vitamin, may be acquired from exogenous sources or synthesized in the skin (Figure 4).

Keeping in view, its multiple roles in maintaining homeostasis in musculoskeletal, cardiovascular, immune, neuropsychiatric and dermatological systems its shocking to realize that about half the world’s population suffers from vitamin D insufficiency while well over a billion people are frankly deficient.¹

Since sunlight is known to play a role in Vitamin D metabolism, people living in countries receiving ample sunshine are assumed to have enough vitamin D levels and are lulled into a false sense of security. Pakistan is one such country. The sun shines brightly in ten to eleven months of the year. But paradoxically, numerous studies have reported alarmingly low levels of vitamin D. 6-8Our study also revealed a very low overall mean of 23.07 nm/ml (Figure1).

The various factors involved are discussed here.

Perhaps the one that needs to be addressed first is the ever-worsening pollution. Lahore has held the alarming position of being in the worst polluted cities in the world for the last few years.¹⁰ The possible causes include a steep rise in number of automobiles on the road, lack of measures to

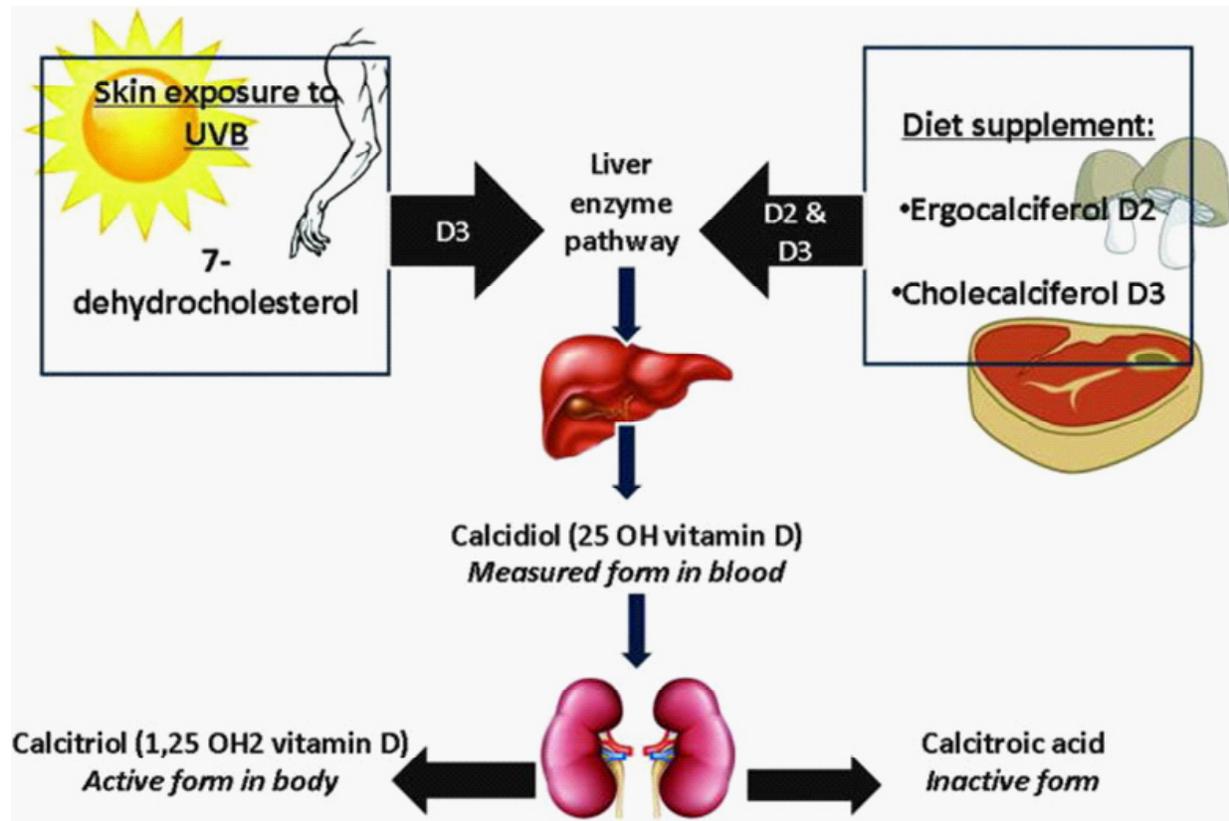


Figure-4: The sources and kinetics of vitamin D in human body³

check vehicles with high emissions, unchecked deforestation, increasing urbanization, relentless growth of industrial units within residential areas and setting up in its vicinity of coal plants to generate electricity. All these factors have led to an unabated rise in air pollution which raises distressing health concerns.^{11,12} The ensuing blanket of smog blocks out UVB rays which are essential for the synthesis of vitamin D in skin. Hence, air pollution has been termed a neglected risk factor for hypovitaminosis D.^{13,14}

Another reason for this pronounced deficiency is said to be the tendency of our ladies to stay covered up while outdoors; even our men are generally well covered. In our geographic location at least 10-48 minutes exposure to the sun (with at least 25% of skin exposed) would be required to for biosynthesis of adequate Vitamin D.¹⁵ This is almost impossible with our current cultural practices.^{16,17}

The low production of vitamin D in skin in our population is further compromised by the rather dark skin tone of our population. People with such skin tones are said to require three to five times the exposure required by their white skinned counter-

parts to achieve similar vitamin D levels. To make matters worse the trend to use sunblocks is on the rise, further aggravating the deficiency of this vital factor.^{15,18,19}

Another often overlooked factor is the relationship of body weight to requirements of vitamin D. Obese people have greater vitamin D requirements than their lean counterparts. This happens because body fat serves as a reservoir of vitamin D, so an increased body adipose mass increases sequestration of vitamin D, reducing its bioavailability.^{20,21} With obesity now being rampant in our society, we need to be extra cautious regarding the levels of vitamin D in our population.

Some groups have a higher risk of developing vitamin D deficiency than the general population. This includes older people, people with malabsorption disorders and people who have undergone gastric bypass procedures. Disorders like celiac disease and cystic fibrosis also precipitate or worsen the deficiency.^{5,22}

It has also been shown that administration of glucocorticoids lowers the serum levels of vitamin D.²³ This is postulated to happen by two mecha-

nisms. First, steroids promote the catabolism of Vitamin D and second they promote weight gain. The deleterious effect of increasing body fat stores on vitamin D levels have already been discussed. There is an unfortunate tendency by our medical practitioners to overprescribe steroids. It leads to numerous side effects, vitamin D deficiency being one of them. This tendency needs to be checked.

In our study, the mean level of vitamin D was lower in males (20.28 ng/ml) compared with females (25.42 ng/ml). This difference depicted in Figures 1&2 was found to be statistically highly significant (p value < 0.0001). What was even more surprising was that women in the age group 50-59 years had the highest levels of vitamin D (Figure3). This seemingly paradoxical finding could be explained by the fact that females of this age are prone to complaints of backache, knee joint pains and other manifestations of osteoarthritis. They often seek medical help for these ailments and are prescribed vitamin D supplements in addition to other standard therapies. This could explain the higher levels of vitamin D in this group.

Hence, the findings of the study highlight the pronounced deficiency our population faces of a vital biochemical component. This issue needs to be addressed by the healthcare providers as well as the government. The healthcare providers could help by making the public aware of the issue and educating them on the ways to combat it. This would include in addition to the factors discussed above judicious use of butter and desi ghee. Both are known to be rich sources of Vitamin A, D, E, and K in addition to conjugated linoleic acid.^{24,25}

For some decades the use of butter and desi ghee has been discouraged since they were shown to contribute to high serum cholesterol and its attendant health risks. But recent studies have shown that judicious use of butter and ghee provides health benefits that outweigh the risks. They are now considered to be nutrient-dense foods and eliminating them from diet is likely to result in more harm than good.²⁶

Another point that we need to let the public know is that most glass windows are transparent to UV radiation to a wavelength of about 330 nm i.e., UV-A. This transparency is quite high so almost all UV-A light rays pass through routine glass windows. At the same time, radiation below 330 nm is almost totally blocked, so UV-B is blocked, and vitamin D production is not possible with light passing through glass.²⁷

The government needs to ensure that appropriate foods are adequately supplemented with vitamin D. Vitamin D fortification has shown a multitude of health benefits in various studies. Such programs are established in countries like US, Canada and Finland. Health authorities in our country are also required to institute similar measures to ensure our public doesn't stay deprived of this essential micro-nutrient²⁸⁻³⁰.

CONCLUSION:

In conclusion, it is the joint responsibility of healthcare providers, social media activists and the government to devise strategies to spread awareness of the problem and formulate and implement policies to correct deficiency of this vital micronutrient. This simple step could help in prevention of innumerable diseases.

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