



### From the Editor's Desk

**Dear Colleagues,**

A sure way of standing tall and enjoying a healthy life is to keep your bones healthy through the adequate consumption of Vitamin D and its metabolites. These have an interrelationship with bone metabolism and calcium homeostasis, along with regulating cellular function such as muscles' and bone strength. Its vital functions include regulating the absorption of calcium and phosphorus and facilitating normal immune system function.

Vitamin D also has an important role in modulating both innate and adaptive immune responses. Its sufficiency protects against viruses, especially respiratory ones and it increases the production of antiviral proteins while it decreases cytokines. Its deficiency hampers the host's ability to activate the defensive pathways. This at present is being noticed and linked to the current pandemic of COVID-19. Several studies have shown the incidence of this viral infection high in Vitamin D deficient patients.

There is a silent epidemic of Vitamin D deficiency which is a global problem today. It occurs when the usual intake is lower than recommended levels over time, exposure to Sunlight is limited, kidneys cannot convert 25 (OH) D to its active form, or absorption of Vitamin D from the digestive tract is inadequate.

Vitamin D deficient diets are associated with milk allergy, lactose intolerance and veganism. Genetic factors and fat malabsorption may also affect its bioavailability. This deficiency is under diagnosed and hence untreated in most parts of the World. Our average Indian diet fails to satisfy the Vitamin D requirement, hence the intake of supplements and fortification of various foods with Vitamin D through national programs is needed. Dieticians and health care providers should motivate the people to have sufficient exposure to sunlight, make them aware of the importance of Vitamin D and the consequences of its deficiency.

We are passing through very difficult times across the world. I wish all our readers good health and strong immunity during this pandemic. Please Stay Safe - Stay Positive.

**- Madhu Kaul**

### From the TDA Convenor's Desk

**Dear Friends**

I am writing this at a time when the whole world is grappling with an unprecedented pandemic. Today while we all are fighting the COVID-19 in our own ways, we need to specially appreciate and acknowledge the efforts of health care professionals in every country, who are going out of their way to save lives of COVID patients. During this crisis situation, right communication at the right time plays a key role in bringing focus to the right direction.

Indian Dietetic Association, Chandigarh Chapter, is leveraging technology during this period of Lockdown and Social Distancing. We are communicating frequently with all the members digitally regarding safe and healthy eating, life style practices and measures to boost immunity. The video links and information regarding online webinars organized by different organizations are also being shared from time to time so that members can attend these webinars and contribute/update their knowledge. Recently we shared a link for an International Conference – "4th International Diabetes Experts Conclave (IDEC2020)". More than 25000 participants from 37 countries attended this conference online.

I hope you all have been benefitting from these initiatives. Let us continue working together to sharpen and further strengthen our knowledge base with the help of available digital scientific fora.

Finally I urge every one of you to maintain a safe and healthy lifestyle and defeat **COVID-19**.

**-Sunita Malhotra**

# VITAMIN D - It's Role in Health and Disease

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## INTRODUCTION

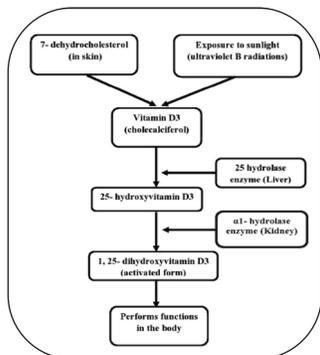
*All those vitamins aren't to keep death at bay, they're to keep deterioration at bay.*

-Jeanne Moreau

Vitamin D works in tandem with various other chemicals and performs various roles in the body by helping us shore up bones and muscles, bolster immune system and repair cellular damage. In this new-age where human beings want magic potions to ease their ills, it is no wonder that some quick health fixes may go berserk without proper knowledge about its role, usage and functions in maintaining health. It is a well-known axiom that 'Great things come in small packages' and it is best suited to the mammoth tasks done by it for the wellness and vitality of our body. The present article attempts to give an insight into the role of Vitamin D in health and disease.

A century ago, in the year 1919, Sir Edward Mellanby discovered this vitamin by providing conclusive evidence that rickets is a dietary deficiency disease caused due to lack of Vitamin D in the body. In 1928, Adolf Windaus, a German chemist isolated its precursors and received the Nobel Prize for the same (1).

## HOW IS VITAMIN D METABOLIZED?



Flowchart of Vitamin D metabolism (4).

This sunshine vitamin is lipid-soluble with very few food sources. Calciferol or Vitamin D is produced naturally in the body through direct exposure of skin to ultraviolet B radiations of sunlight. When ultraviolet B radiations from the Sun strike the skin, 7 dehydrocholesterol yields a provitamin which further forms Vitamin D<sub>3</sub> or cholecalciferol. It is further transported in the blood through Vitamin D binding

protein and undergoes metabolism in the liver and kidneys forming 1,25- dihydroxyvitamin D- calcitriol, an activated form of Vitamin D (2). Playing a dual role of a prohormone as well as a vitamin, calcitriol is essential for antirachitic activity or bone formation as well as mineral homeostasis. Stored in the adipose tissue of the body, it is mobilized in times of need, but at the same time, excessive stores maybe toxic to the body. Though India being in the tropical region and its natives receiving abundant sunshine the whole year around, yet, hypovitaminosis D has still been documented in 50-90% of the population making the case that Vitamin D deficiency is underrated and should be recognized as a public health problem. (2,3)

## WHY DO WE NEED VITAMIN D?

**Calcium Absorption:** Vitamin D as a prohormone enhances the active absorption of calcium from the small intestine. Calcitriol and Vitamin D receptor (VDR) proteins bind to form VDR-calcitriol complex. This complex attaches itself to the Vitamin D response elements (VDRE) for specific mRNA transcription for specific proteins including calcium-binding protein (calbindin), which increases calcium absorption, maintaining appropriate serum calcium and phosphorus concentrations (2,4).

**Calcium Phosphorus Homeostasis:** Activated Vitamin D along with parathormone aid in moving calcium from bones to plasma to maintain normal serum calcium and phosphorus levels. Along with this, calcitriol in kidneys enhances tubular reabsorption of the two minerals into plasma for maintaining concentrations (4).

**Bone And Growth Modelling:** Normal bones in the body are constantly being remodelled. Vitamin D along with an adequate supply of calcium and phosphorus aids in not only calcification but also in the process of endochondral formation. Further, Vitamin D also promotes muscle strength in the body (4,5).

**Boosts Immunity:** Various studies have suggested that an adequate amount of Vitamin D in the diet may reduce the risk of infectious diseases such as flu, cough, cold and tuberculosis. It has been seen that the active form of Vitamin D boosts immune cell production to fight inflammatory responses (6).

**Prevents Lifestyle Diseases:** Researches have suggested that optimum serum Vitamin D levels could reduce the risks of non-communicable diseases. Obesity has been found to have an inverse relation with Vitamin D. Framingham Heart Study's research showed that low Vitamin D concentrations among patients increased the risk of heart diseases. The vitamin also aids in promoting apoptosis which may help in preventing various types of cancers. Supplementation of Vitamin D may in addition reduce the risks of type 1 diabetes as it is involved in cell proliferation (6).

**Prevents Mental Illness:** Vitamin D prohormone acts as a neurosteroid that plays a vital role in brain health. It activates genes that release serotonin and dopamine neurotransmitters which in appropriate amounts regulate mood (7).

## WHERE DO WE GET THE VITAMIN FROM?

Vitamin D has three major sources in diet:

### Food

As mentioned, Vitamin D is present in very few natural sources especially for vegetarians. Flesh of fish, fish liver oils, liver,

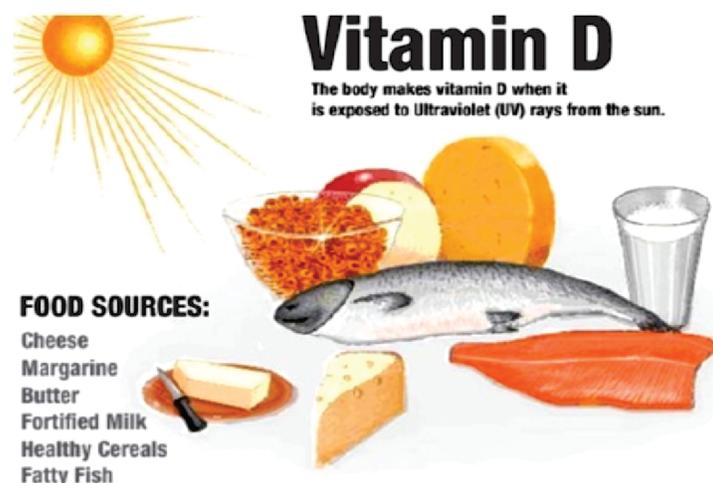
whole milk, butter, cream, cheese, mushrooms, sun exposed yeast and egg yolk contain some amounts of Vitamin D (2).

### Fortified Foods

Milk and dairy products, ready to eat cereals and oils fortified with Vitamin D are primarily being used for Vitamin D consumption. However, it is pertinent to check the food label and certification cautiously to ensure that we as consumers are not being tricked. (2).

### Sunlight

Ultraviolet radiations B are in the range of 290-320 nanometers which can penetrate the uncovered skin for the production of Vitamin D. Researchers have suggested that 5-30 minutes of exposure to skin (without sunscreen) between 10AM to 3PM at least two times a week is sufficient for adequate Vitamin D synthesis. But, at the same time, it is imperative to understand that UV radiation is a carcinogen. Excessive exposure may lead to skin cancer (2).



Food sources of Vitamin D

### RECOMMENDATIONS

The Indian Council of Medical Research (ICMR) recommends a daily supplement of 400 IU/day of Vitamin D for all Indians irrespective of age and gender under situations of minimal exposure to sunlight.

### DIAGNOSTIC TESTS

The tests run to check Vitamin D levels in the body are:

- Plasma 25(OH)D or Calcidiol Test
- Vitamin D- 1,25- Dihydroxy Test
- Radioimmunoassay (RIA)

Vitamin D status	The serum level of Vitamin D in ng/ml
Deficiency	<20
Insufficiency	21-29
Sufficiency	>30
Toxicity	>150

Figure: Diagnostic levels of Vitamin D (5)

Plasma 25(OH)D and 1,25- Dihydroxy blood tests are the most common and reliable markers of Vitamin D levels. (8).

The Vitamin D status is checked as per the serum level given in the figure:

### TOO LESS OF THE VITAMIN

As mentioned above, Vitamin D has a plethora of functions which have powerful effects on several systems in the body. Depreciation of the nutrient may happen due to the following reasons:

### DIETARY CAUSES FOR DEFICIENCY

- Most of the dietary sources of Vitamin D are non vegetarian and most of the Indians are vegetarian. Milk is one of the food sources but its adulteration makes Vitamin D less available to the body (8).
- Despite being a robust and heat stable vitamin, it has an inverse relation to time. Slow cooking practices cause degradation of the vitamin. Boiling milk again and again for some minutes reduces Vitamin D content (8).
- Malabsorption: Lactose intolerance lowers intake of milk which reduces the consumption of Vitamin D from a vegetarian source (8). Since it is a lipid-soluble vitamin, its absorption relies on the ability of the gut to absorb lipids. Less absorption of lipids due to irritable bowel syndrome, celiac disease, liver disorders or Crohn's disease may hinder the absorption of Vitamin D into the body as well (2).

The deficiency of Vitamin D cannot only be labeled on dietary inadequacy. Various other reasons can cause its shortfall:

- Limited Sun exposure: Customs, religions, occupation, pollution and excessive use of sunscreen may reduce the exposure to sunlight which reduces the production of Vitamin D (2,6).
- Excess of melanin pigment: Studies have shown that greater the amount of melanin pigment in the body, lesser is the endogenous production of Vitamin D from sunlight (2).
- Unplanned pregnancies: Frequent and unplanned pregnancies accompanied with low dietary consumption reduces the stores of Vitamin D in the woman's body further deteriorating the health status of both mother and child (5).
- Delayed Weaning: Vitamin D deficiency may be seen in cases where there are extended breastfeeding practices. The requirements of Vitamin D cannot be solely met by breast milk in infants. It is essential to supplement their diet after six months of exclusive breastfeeding (2,5).
- Age: The elderly population has malabsorption, lower absorption of nutrients and spend more time indoors leading to reduced requisite Vitamin D content in the body (5).

- *Skin, kidneys and liver disorders: Metabolism of Vitamin D can be hampered due to any of these organ disorders leading to the decreased production of active Vitamin D (2).*
- *Faulty Lifestyle: Long working hours, sedentary lifestyle, staying indoors most of the time and urbanization also plays a role in reducing synthesis of Vitamin D (5).*
- *Surgery: Gastric bypass surgery may lead to reduced absorption of Vitamin D in the body (5,6).*

## CONSEQUENCES

*Unfortunately Vitamin D deficiency is underrated and goes undiagnosed. As a result, most of the population do not realize that this could also be a root cause of various problems being suffered by them.*

## CHILDREN

### Rickets

*Inadequate Vitamin D in the body leads to low absorption of calcium and phosphorus. Described by the British researchers for the first time, there are structural abnormalities in bones which carry the weight of the body: arms- humerus, ulna and radius; legs- tibia. The bones become soft and bent and cannot withstand weight, strain and stress of the body. Bone pain and muscular tenderness are also accompanied. Bow shaped legs, knock knees, beaded ribs known as rachitic rosary, pigeon chest and enlarged frontal bone of the skull, making it more prominent are an outcome of rickets. Poor mineralization shows increased epiphyseal growth in wrists and ankles (2,4).*

## ADULTS

### Osteomalacia (Adult Rickets)

*Low dietary intake of Vitamin D and calcium leads to softening of bones known as osteomalacia causing pain in bones and weakening of muscles. The bones become fragile and weak; they are not able to withstand body weight, increasing susceptibility to fractures. The bones of legs, back, chest and pelvic area may get deformed due to which pregnant women may have difficulties during child-birth. Legs and lower back has severe pain in this condition (4).*

### Osteoporosis

*Long term deficiency of Vitamin D and calcium leads to osteoporosis. This condition is seen primarily in elderly post menopausal women as they mostly have lesser skeletal mass as compared to men. Calcium metabolism is hampered because of decrease in the secretion of estrogen (in females) and testosterone (in males) hormones owing to which there is deterioration of bone mass and escalation of porosity in bones. Bones get bent and chances of breakage are aggravated (4).*

## DISEASES

- *Vitamin D deficiency may increase the risk of heart diseases. Since the vitamin promotes bone and muscle*

*strength, low levels may lead to heart failures (5,6).*

- *Low levels, especially during winters may increase the inflammatory responses of white blood cells causing susceptibility to flu and common cold (5).*
- *Decreased Vitamin D in the body may reduce programmed cell death (apoptosis) due to which the damaged cells can survive, which becomes a stepping stone towards development of cancer. (5,6).*
- *There are a myriad of factors responsible for sensitive mental conditions. Low levels of neurosteroid-Vitamin D may lead to reduced secretion of serotonin and dopamine, a causative factor for depression. Low serum Vitamin D levels in early life may also lead to problems in learning (7).*

## TOO MUCH OF THE VITAMIN

*Excessive intake or storage of Vitamin D is also not conducive to the body. Vitamin D toxicity is caused due to excessive intake of its supplements. The over doze may be taken to treat ailments such as hypocalcemia, osteomalacia, hypoparathyroidism and end stage renal disease (10). Hypervitaminosis D leads to hypercalcemia (high levels of calcium in blood), hyperphosphatemia and calcinosis (calcification of soft tissues) of kidneys, lungs and heart. Higher intake of supplements, especially by women post their menopause to maintain adequate stores may backfire leading to kidney stones. Nausea, headaches, vomiting, diarrhea, polyuria, and anorexia are common symptoms seen during this condition (2,4,5).*

## THE WAY FORWARD...

### SUNLIGHT EXPOSURE

- Sunlight exposure for 5-30 minutes between 10AM to 3PM, two times a week can aid in synthesizing requisite amount of Vitamin D in the body.

### FORTIFICATION

- Fortification of Vitamin D in milk based foods, cereals as well as oil may aid in reducing its deficiency.

### CREATING AWARENESS

- Educational programmes to generate awareness in people may aid in reducing hypovitaminosis D which majorly goes undiagnosed and untreated.

### SUPPLEMENTATION

- Good quality supplements given in the requisite amount may help population at risk (children, pregnant and lactating women).

### ACCESSIBLE AND AFFORDABLE TESTING FACILITIES

- Facilities to check Vitamin D levels at an affordable rate can also lead to the problem not going undetected.

### REGULAR CAMPS

- Regular camps at grass root level for checkups can help in diagnosis and proper treatment.

### RESEARCH

- Adequate research to find out more information on Vitamin D, its deficiency and various strategies to overcome it is pertinent.

## VITAMIN D AND COVID-19

The global pandemic, coronavirus disease (COVID-19) is an infectious, respiratory illness without any vaccine or special treatment. Currently, the only preventions for this deadly disease are following good hygiene practices and boosting one's body's immunity by consuming the right kind of foods. Researches have shown that one of the contributing factors among vulnerable group of population for Covid-19 is low Vitamin D levels. Supplementation of Vitamin D may exhibit properties to protect the body against acute respiratory infections (9).

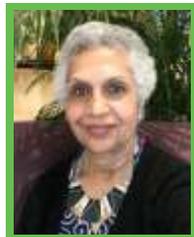
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## VITAMIN D – A Possible Link With Covid 19

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With the world going through a pandemic of COVID 19, it would be prudent to take a peek into the possible crucial role of Vitamin D (VD) in enhancing resistance to this viral infection, which primarily is known to be a respiratory infection. The role of VD in enhancing the body's immune mechanism has been researched extensively

and there appears to be a strong evidence to show that a deficiency of this fat soluble vitamin could play a significant role in the failure of the body's defence mechanism against COVID 19.

Scientists at the University of Edinburgh have demonstrated the effect of mechanism of VD in the immune system, through the T cells being activated by the dendritic cells. It is the T cells which have an important role to play in resisting infections in healthy people. Studies have demonstrated that dendritic cells could produce more of a molecule called CD31 on their surface which further hindered the activity of the T cells, thereby weakening the immune system(1).

Low VD has been associated with increased risk of respiratory diseases, including tuberculosis, asthma and chronic obstructive pulmonary disease besides bacterial and viral respiratory infections and COVID 19 is well known as a viral respiratory illness. The deficiency can therefore decrease the

lung function, an important factor to fight such infections.

The latest observations of a group of researchers from Ireland have strongly advocated the use of VD supplements to aid resistance of respiratory infections such as the corona virus or at least limit the severity of those infected. According to them, VD can modulate the innate and adaptive immune responses, thereby increasing autoimmunity as also increased susceptibility to infection.

They recommend that adults take 20-50 micrograms of VD per day to meet the purported benefits, till the confirmation of an effective vaccine and drug treatment is made available for COVID 19. They also strongly recommend immediate supplementation of all hospital healthcare workers to help limit infection and flatten the curve (2).

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# VITAMIN D - Sarcopenia and Aging

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## INTRODUCTION

**Vitamin D** is fat-soluble vitamin and hormone supplied by cutaneous synthesis on sunlight exposure and has an essential role in calcium homeostasis and bone metabolism (1). Data suggest that vitamin D status is crucial for the normal function of

different organs, such as pancreatic beta cells, vascular endothelial cells, osteoblasts, and myocytes where vitamin D receptors are expressed. Vitamin D status is generally low among people with muscle and bone wasting. Low vitamin D levels have been found to be related with number of diseases and sarcopenia is one of them.

**Sarcopenia** is a type of muscle loss that occurs with aging or immobility. It is characterized by the degenerative loss of skeletal muscle mass, quality and strength (2).

Sarcopenia is considered as a complex geriatric syndrome because of its multifactorial pathogenesis. Several age related factors such as neuromuscular degeneration, changes in muscle protein turnover, changes in hormonal levels, sensitivity, chronic inflammation, comorbidities, oxidative stress, hormonal alterations, severe stress, unhealthy diet and lack of physical activity are involved in the development of Sarcopenia. These factors directly and indirectly can trigger an imbalance between muscle anabolism and catabolism.

**Vitamin D supplementation may potentially reduce the risk of sarcopenia and prevent disability through a beneficial effect on muscle strength and reduce the risk of falling.**

- Factors causing sarcopenia:**
- Aging process
  - Stress
- Faulty lifestyle:**
- Physical activity vs sedentary, smoking, elevated BMI.
- Gene variation:**
- DNA damage, shortened, cell senescence.
- Chronic diseases:**
- Cardiovascular diseases, arthritis, stroke, diabetes, chronic kidney and pulmonary diseases.

## VITAMIN D AND MUSCLE FUNCTIONS

The endogenous production of vitamin D depends on age, ethnicity, availability of the precursor in the skin, skin pigmentation, seasonal variation of Sun luminosity, regional latitude, daytime and duration of Sun exposure, skin area exposed, use of sunscreen and clothing (3).

Vitamin D deficiency is a common health problem worldwide, in particular among older people. The effect of vitamin D on the muscle has been widely investigated, suggesting that this hormone can stimulate the proliferation and differentiation of skeletal muscle fibers, maintaining and improving muscle strength and physical performance.

Older persons have a higher prevalence of low vitamin D levels as a consequence of low dietary intake and reduced ultraviolet irradiation of the skin. Therefore, older people with vitamin D deficiency might be at risk of sarcopenia,

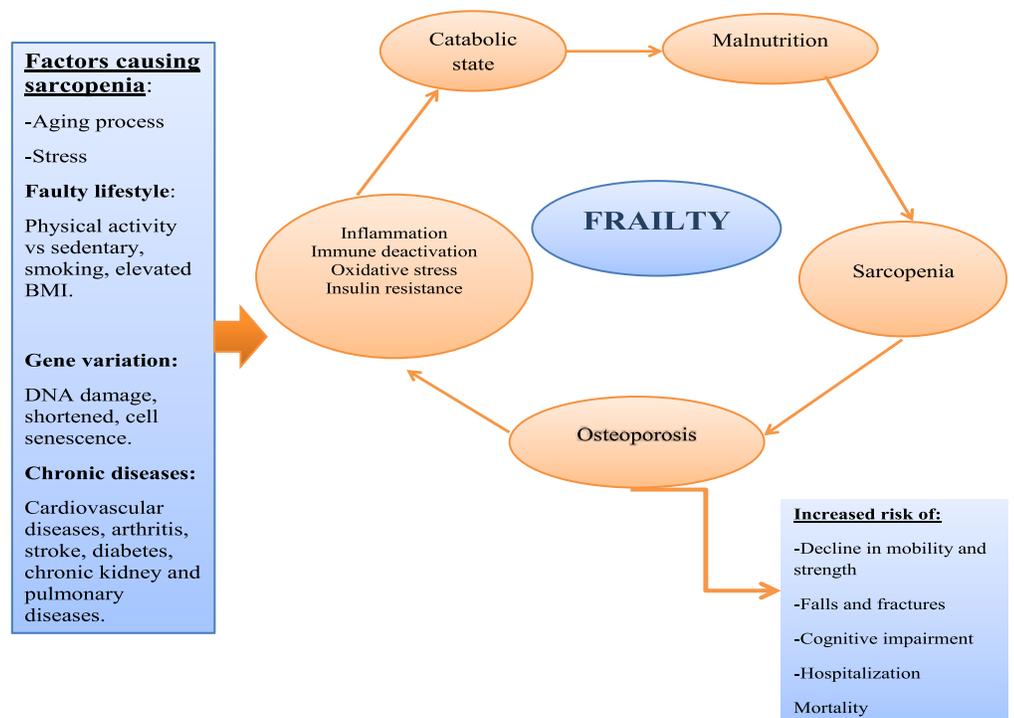
## EFFECTS ON MUSCLE CELL TYPES

Muscle cells can be divided in two main types: type I and type II (4).

1) **Type I muscle cells** are considered slow twitch, characterized by aerobic metabolism with low power production and high endurance capacity.

2) **Type II muscle cells** are defined as fast twitch,

## Vitamin D, Sarcopenia and Frailty



characterized by anaerobic metabolism with high speed and strength contraction, important for sprinting exercises. They have a pale color, due to a low number of mitochondria, lower amount of myoglobin and fewer capillaries.

Vitamin D affects the diameter and the number of type II muscle cells that induce fast muscle contraction velocity, and are crucial for anaerobic maximal intensity short-burst activities. Type II fibers are important, not only for young athletes, but also for the elderly, because of their capacity to reduce, for example, the risk of falling.

### **VITAMIN D DOSAGE AND CUTOFF DEFICIENCY VALUE IN SARCOPENIA**

The current recommendations for vitamin D are 50nmol/l and protein intake is 1-1.2 g/kg/day. This should be considered the minimum for adults with sarcopenia to respond adequately to nutritional strategies aimed at attenuating muscle loss.

The cut-off value defines low vitamin D status:-

Deficiency- <25nmol/L

Insufficiency- 25-75nmol/L

Sufficiency- >75nmol/L

There is a strong evidence that vitamin D supplementation increases muscle strength and mass in patients with sarcopenia. Sufficient levels of 25-hydroxy vitamin D along with adequate protein, calcium, antioxidants and long chain polyunsaturated fatty acids intake may be required to increase muscle mass (5).

The analysis of vitamin D doses specific to individuals visa-vis age and disease specific is also very important as too high doses can increase the number of falls and may have other

side effects related to toxicity.

### **CONCLUSION**

Vitamin D deficiency is very common in older people, and since vitamin D has many other fundamental biological effects beside skeletal muscle trophism, clinicians should screen vitamin D levels in sarcopenic patients. They should advocate oral supplementation to any older person with vitamin D deficiency or insufficiency. Furthermore, patients at risk of or with established sarcopenia should be encouraged to be involved in regular physical activity and to increase their intake of proteins and/or essential amino acids.

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# Indian Women Need More “Sunshine Vitamin” For Good Health

*Dr. Ritu Pradhan, Head and Associate Professor, Foods and Nutrition Department, Government Home Science College, Chandigarh.*



An alarmingly large number of Indian women, nearly 70-80 percent suffer from Vitamin D deficiency. Vitamin D is often called the 'Sunshine Vitamin' because it is produced when the human body is exposed to ultraviolet rays from sunlight. It is needed for immune function and maintenance of normal blood levels of calcium and phosphate that are required for normal mineralization of bone, muscle contraction, nerve conduction, and general cellular function in all cells of the body(1,2).

Further, Vitamin D is present in very few foods and our Indian diet generally fails to satisfy the daily requirement of Vitamin D for a normal adult.

Vitamin D deficiency is most likely to be found in people who spend most of their time indoors particularly true for Indian women. According to a recent study, at least 70 percent Indians suffer from illnesses that result from low levels of vitamin D. Interestingly, large number of people don't even appear to know about deficiency of Vitamin D as the symptoms of this deficiency are vague and indistinct, and affect an individual both mentally and physically.

Some of the interesting details about vitamin D w.r.t Indian woman are discussed below:

- **Vitamin D deficiency primarily due to social reasons.**

Vitamin D usually occurs due to a lack of adequate exposure to sunlight. Indian women are more prone to the deficiency as they tend to be indoors most of the time. We see it more commonly in women in India because of certain social and cultural taboos that dictate lifestyle patterns such as clothing and diet. For instance, girls traditionally receive less nutrition than boys, which limits their vitamin D dietary options. Moreover, many Indian women cover their body and faces with a veil (**burqah and pardah**), preventing adequate sun exposure. Also, urban women who apply sunscreen are at risk of deficiency.

- **Vitamin D deficiency and dark skin.**

Indian women with dark skin are at a greater risk of vitamin D deficiency as the skin pigment melanin can reduce the skin's ability to produce vitamin D. Melanin is present more in dark skin as compared to light skin. Greater the amount of melanin pigment in the body, lesser is the endogenous production of Vitamin D from sunlight.

- **Vitamin D and weak bones.**

Bone ailments very commonly are a result of vitamin D deficiency as calcium makes bones strong, but the mineral can be absorbed properly only with the help of vitamin D. In the absence of adequate calcium absorption, the body depletes the calcium reserves present in bones, which weaken the bones subsequently. Thus, presence of Vitamin D

deficiency amongst women for a long period, may cause osteoporosis, back pain and even bone fractures(3,4).

- **Vitamin D causes fatigue and muscle pain.**

Common symptoms of vitamin D deficiency like frequent joint pains, exhaustion, drowsiness and muscle pains are very often manifested by Indian women, however these symptoms are not classified as due to deficiency of Vitamin D.

Pregnant women are especially prone to vitamin D deficiency.

Calcium losses during pregnancy may occur due to fetal demands and increased urinary calcium excretion, and these losses increase with advancing pregnancy. Repeated, unplanned, and un-spaced pregnancies in dietary deficient, poorly nourished Indian women have been found to aggravate vitamin D deficiency in the mother and the fetus. This in turn can lead to pre-eclampsia or high blood pressure during pregnancy(3,4).

- **Vitamin D and unborn child.**

If a lady suffers from vitamin D deficiency during pregnancy, chances are that the deficiency will be passed on to the child. Also, breast milk contains a very low level of vitamin D it can lead to a deficiency of vitamin D in babies as well. Maintaining optimum levels of vitamin D are important for pregnant, nursing women, and babies as vitamin D deficiency can lead to problems such as low birth weight, hypocalcemia (low calcium level), rickets of soft bones, type 1 diabetes, childhood asthma and also some immune disorders in babies. The Vitamin D deficient new born babies should be bottle fed with milk which is fortified by vitamin D to overcome the deficiency (4).

- **Vitamin D deficiency increases risk of type 2 diabetes.**

Studies have shown that people who have low levels of this pro-hormone in their blood are at an increased risk of developing Type 2 diabetes. There is a strong inverse association between low levels of 25(OH)D and diabetes prevalence. Low vitamin D levels have also been shown to be predictive of the future development of type 2 diabetes(5,6).

- **Vitamin D being linked to cardiac diseases.**

Several prospective studies have suggested that vitamin D deficiency predisposes individuals to increased risk of incident hypertension, IHD, sudden cardiac death, or heart failure. The mechanism for how vitamin D may improve CVD outcomes remains obscure; however, potential hypotheses include the down regulation of the renin-angiotensin-aldosterone system, direct effects on the heart, and vasculature or improvement of glycemic control(5,6). A drop in the pro-hormone's levels causes abnormalities in sodium and potassium levels, which affects the kidneys, and then leads to a thickening in the left ventricle. As per observation, younger individuals (particularly women), especially those

who work night shifts and lead sedentary lifestyles have been diagnosed with blood pressure problems more frequently than others, and they more often than not have low levels of vitamin D.

● **Vitamin D Deficiency may give blues.**

Vitamin D is crucial not only for bone health but for proper brain development and functioning. Low levels of vitamin D have been found to be associated with depression, seasonal affective disorder, and schizophrenia in adults (7).

● **Prevention of Vitamin D deficiency(3S).**

**a) Sources in Diet:** Eat a diet rich in whole foods. Nutrient-dense, fatty fish like mackerel and sardines are great sources of vitamin D. Other food sources include egg yolks, milk and other dairy products, organ meats like liver and fortified foods are also good sources.

**b) Sun exposure:** Unprotected sun exposure in the golden hours between 10 am - 3 pm for 5-30 minutes at least twice a week is required for production of vitamin D in the body.

**c) Supplements:** Vitamin D supplements may be effective in treating and preventing deficiency under medical supervision and directions. For the healthy Indian population, under situations of minimal exposure to sunlight, a daily supplement of 400 IU has been recommended (8).

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**VITAMIN D – Word Search**

Anshu Dhawan (Maggo), M.Sc. (DFSM), PGDND



Find the following words related to Vitamin D in the word search given below and circle them:

1. 7-dehydrocholesterol
2. Bone health
3. Bone mineral density test
4. Cholecalciferol
5. Collagen
6. Ergocalciferol
7. Hypovitaminosis
8. Immune system
9. Milk and milk products
10. Osteopenia
11. Osteoporosis
12. Porous bones
13. Rickets
14. Sir Edward Mellanby
15. Vitamin D

A	B	O	N	E	M	I	N	E	R	A	L	D	E	N	S	I	T	Y	T	E	S	T	Y
T	P	M	E	U	I	A	F	A	A	I	G	M	M	V	C	O	L	L	A	G	E	N	V
Y	A	H	C	S	A	C	F	R	C	A	R	I	C	K	E	T	S	N	B	F	B	E	I
D	K	E	O	S	G	E	E	T	H	L	O	E	M	G	U	Y	C	I	E	U	O	K	S
7	V	R	R	M	K	F	Y	Y	O	V	7	T	B	O	L	N	O	O	I	F	T	G	C
D	P	G	P	I	W	B	D	S	L	V	C	L	O	F	A	E	S	W	W	P	R	E	S
E	N	O	L	L	R	C	P	W	E	T	Y	B	H	N	K	E	T	S	H	C	T	C	I
H	S	C	S	K	P	H	E	M	C	K	B	R	B	L	A	V	E	D	N	Y	O	B	R
Y	W	A	U	A	P	R	F	N	A	V	H	Y	O	D	O	M	O	B	P	S	L	M	E
D	A	L	I	N	O	L	F	I	L	L	Y	I	W	S	Y	F	P	T	M	B	F	G	D
R	F	C	N	D	R	P	I	P	C	C	P	P	R	P	7	D	O	K	O	S	P	B	W
O	I	I	G	M	O	7	K	S	I	T	O	M	P	7	V	I	R	D	S	C	H	7	A
C	E	F	S	I	U	W	F	F	F	O	V	7	W	W	U	T	O	K	T	E	P	D	R
H	P	E	T	L	S	F	M	B	E	H	I	T	T	M	U	B	S	G	E	E	F	F	D
O	T	R	B	K	B	S	P	O	R	N	T	A	K	H	V	K	I	O	O	W	D	O	M
L	P	O	V	P	O	M	H	N	O	U	A	T	B	A	I	U	S	W	P	Y	K	W	E
E	7	L	S	R	N	G	M	E	L	B	M	B	O	K	T	U	V	D	E	A	S	D	L
S	C	P	T	O	E	U	D	H	T	S	I	C	Y	B	A	K	P	Y	N	D	H	P	L
T	S	V	E	D	S	W	R	E	D	R	N	H	K	P	M	S	T	K	I	V	P	Y	A
E	W	T	Y	U	K	Y	A	A	F	C	O	T	M	S	I	W	Y	G	A	C	M	M	N
R	U	C	A	C	A	F	E	L	O	L	S	W	I	C	N	D	P	H	7	V	H	R	B
O	7	E	H	T	O	T	V	T	D	H	I	I	M	L	D	R	D	M	N	P	T	D	Y
L	S	D	G	S	D	A	V	H	U	D	S	Y	7	N	A	Y	R	G	W	D	S	7	S
Y	T	S	D	A	M	V	L	A	N	U	N	I	M	M	U	N	E	S	Y	S	T	E	M

Answer Key on Page No. 13

## Know Your Executive Committee

**Dt. Banchha Nidhi Behera, M Sc (Dietetics and FSM), PGD in Nutrition and Dietetics, General Secretary, IDA Chandigarh Chapter**



- Presently working as Dietitian, Department of Dietetics, PGIMER, Sector - 12, Chandigarh.
- Have more than 19 years of experience in Clinical Dietetics for providing diet consultation to OPD and IPD patients, teaching interns, and being a co-guide for MD thesis.
- Recipient of Prof A. N. Radha Award for research paper entitled "Clinical Spectrum and various Predisposing factors in Childhood Obesity" at 42nd Annual National Conference of IDA in December 2009 held at Lucknow (U.P).
- Won International best poster award as co-author for paper entitled "Nutritional deficiency in Postpartum period is associated with increased risk of gall bladder dysfunction" presented at Australian Gastroenterology week, October 2008 at Brisbane, Australia.
- Worked as a resource person at Educational Institutions, Anganwadi centres, PHC in and around the Tricity.
- Participated in various National Conferences, CME programmes, Workshops, Seminars and in several Radio Talks.
- Participated as a key resource person for formulation of guidelines on "IBD and Diet :Asian working group" under the aegis of Colitis Crohn's Foundation (CCF), India on 25th February 2018 at DMCH, Ludhiana and subsequently the guidelines for Asian working group was published in Indian Journal of Gastroenterology, May - June 2019.
- Participated as an Advisory Board Member to initiate a programme for "Training IBD Dietitians under the aegis of CCF (India) in the Advisory Board meeting held on 16th November 2019 at DMCH, Ludhiana.
- Published a recipe book titled "Gluten free recipes for Celiacs" both in English and Hindi.
- Published a Booklet titled "Healthy and Enjoyable Gluten Free Life " for Celiacs ,contributed a chapter on "Cut Flab Stay Healthy" in a Dietetics PGI booklet and contributed a chapter on "Nutrition in GI Infection in a medical book "Infections of Gastrointestinal System".
- Contributor of articles in Newspapers, Magazines, on different topics of Nutrition and Diet.
- Became Registered Dietitian in the year 2014.  
Life Member -  
Indian Dietetic Association, Nutrition Society of India  
Indian Society for Parenteral and Enteral Nutrition.

## Did You Know

**Saloni Jain, Assistant Professor, D.A.V. College, Chandigarh**



- Mandatory milk fortification legislation was first introduced in 1935. Currently, there are 14 countries that have mandated milk fortification. Eleven of the Fourteen countries fortify milk with both Vitamin A and D.(1)
- Most RTE (ready-to-eat) breakfast cereals in the United States are fortified with vitamin D, whereas few yogurts or margarines are fortified with it. Fortification of RTE breakfast cereals with vitamin D is unlawful in Canada, while fortification of margarine is mandatory. Moreover cooking oils are not fortified in any of these Countries.(2)
- According to the World Health Organization (WHO), about 424 000 fall-related deaths occurred globally in 2004 and about one fifth of them (95 000 deaths) took place in India. Vitamin D deficiency was found to be the major contributor in it.(3)
- As per the FSSAI standards, edible oil can be fortified with vitamin A and D. The incremental cost to fortify edible oil is around 10 paise per litre.(1)
- A glass of fortified milk (320ml) can provide approximately 34 percent of the recommended daily allowance of Vitamin A and 47 percent of Vitamin D.(4)
- Skin exposed to sunshine indoors through a window will not produce vitamin D as UV-B rays cannot penetrate through glass.(5)
- Government of Gujarat was the first state in India to initiate fortification of edible oils with 2 IU of vitamin D per gram of oil. (4)
- The India Nutrition Initiative - TINI (a TATA Trusts Initiative) in partnership with GAIN (Global Alliance With Integrated Nutrition) is working on edible oil fortification with vitamin A and D in 8 states (Punjab, Haryana, Rajasthan, Madhya Pradesh, Maharashtra, Gujarat, Andhra Pradesh and Telangana).(1)

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# Magnitude of Vitamin D Deficiency in India

Dr. Uttara Singh, Government Home Science College, Sector-10, Chandigarh



Today's global concern is the deficiency of vitamin D, although it is very easy to obtain from sunlight along with a balanced diet. Several preventive measures have been advised to cure and overcome vitamin D deficiency either through short term or long-term

intervention strategies. Few recent studies conducted in various parts of India have been quoted in the light of magnitude of vitamin D deficiency. Kamboj et al (1) reported that 93 and 85 per cent children (aged 10-18 years) belonging to lower and upper socio-economic groups respectively suffer from vitamin D deficiency. A

high prevalence of vitamin D deficiency >65% was reported among infants, pregnant and lactating mothers. The prevalence of hypovitaminosis D ranged from 84.9 to 100 per cent among school-going children, 42 to 74 per cent among pregnant women, 44.3 to 66.7 per cent among infants, 70 to 81.1 per cent among lactating mothers and 30 to 91.2 per cent among adults.

The community-based Indian studies of the past decade done on apparently healthy controls reported a prevalence ranging from 50% to 94%. These studies which included various age groups reflect the magnitude of the problem (2).

Location of the Study	Sample Size	Participants	Prevalence (%)
Hyderabad, Urban, Andhra Pradesh	298	>60 years	56.3
Shimla, Himachal Pradesh	626	Children (6-18 Years)	93.0
Delhi	960	6-30 months	34.5
West Bengal	222	Rural postmenopausal women (45-70 years)	51.0
Cuttack, Odisha	3056	30-65 years	84.9
Ahmedabad, Gujrat	444	No specific age groups/ gender preference	93.3
Punjab	150	17-68 years	90.0
Jammu Kashmir	312	Postmenopausal women	53.4
Varanasi, Uttar Pradesh	200	Adults >50 years	58.0

Community-based studies on prevalence of Vitamin D deficiency in India (2)

## CONCLUSION

As per the studies conducted on vitamin D deficiency in India, it was found that it is prevalent in every age group. So, it needs to be addressed with due attention and strong action.

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### Evidence that Vitamin D Supplementation could Reduce Risk of Influenza and Covid-19 Infections and Deaths

William B Grant et al., *Nutrients*: 2020 Apr 2;12(4):E988



#### ABSTRACT:

**Objective:** This abstract states the roles of vitamin D in reducing the risk of respiratory tract infections, knowledge about the epidemiology of influenza and COVID-19, and how vitamin D supplementation might be a useful measure to reduce the risk of catching infection.

**Background:** Through several mechanisms, vitamin D can reduce risk of infections. Those mechanisms include inducing cathelicidins and defensins that can lower viral replication rates and reducing concentrations of pro-inflammatory cytokines that produce the inflammation that injures the lining of the lungs, leading to pneumonia, as well as increasing concentrations of anti-inflammatory cytokines. Evidence supporting the role of vitamin D in reducing risk of COVID-19 includes:

- That the outbreak occurred in winter, a time when 25-hydroxyvitamin D (25(OH)D) concentrations are lowest

- That the number of cases in the Southern Hemisphere near the end of summer are low;
- That vitamin D deficiency has been found to contribute to acute respiratory distress syndrome; and,
- That case-fatality rates increase with age and with chronic disease comorbidity, both of which are associated with lower 25(OH)D concentration.

#### CONCLUSION AND RECOMMENDATIONS:

To reduce the risk of infection, it is recommended that people at risk of influenza and/or COVID-19 consider taking 10,000 IU/d of vitamin D3 for a few weeks to rapidly raise 25(OH)D concentrations, followed by 5000 IU/d. The goal should be to raise 25(OH)D concentrations above 40-60 ng/mL (100-150 nmol/L). For treatment of people who become infected with COVID-19, higher vitamin D3 doses might be useful. Randomized controlled trials and large population studies should be conducted to evaluate these recommendations.

### Should VITAMIN D be Routinely Checked for all Chronic Obstructive Pulmonary Disease Patients?

Navin Kumar Mishra et al., *Lung India*. 2019 Nov-Dec; 36(6): 492

#### ABSTRACT:

**Background:** This study aimed to compare the vitamin D levels between chronic obstructive pulmonary disease (COPD) patients and healthy controls and to describe the correlation between vitamin D levels and lung functions.

#### Methods:

Fifty COPD patients (cases) and 30 healthy volunteers (controls) were recruited and their serum vitamin D level was measured together with lung function (forced vital capacity and forced expiratory volume in 1 s [FEV1]) by spirometry.

Vitamin D was categorized as 20 nmol/l: deficient, 21-50 nmol/l: inadequate, and 51 nmol/l as sufficient.

#### Results:

In this case-control cross-sectional study, lower vitamin D levels were associated with lower lung function in both cases as well as controls, the effect being more pronounced in cases. Mean FEV1 at vitamin D 20 nmol/l ( $0.98 \pm 0.40$  vs. controls  $1.93 \pm 0.24$  with  $P = 0.006$ ), mean FEV1 at vitamin D 21-50 nmol/l ( $1.55 \pm 0.54$  vs.  $2.20 \pm 0.31$  with  $P = 0.000$ ), and mean FEV1 at vitamin D 51 nmol/l ( $2.06 \pm 0.54$  vs.  $2.20 \pm 0.31$  with  $P = 0.002$ ). Moreover, the severity of predicted postbronchodilator FEV1% was also much lower among COPD cohort versus healthy volunteers (mean FEV1%: cases  $47.88 \pm 14.22$  vs. controls  $58.76 \pm 15.05$  with  $P = 0.002$ ).

## Conclusions:

Importantly, lung function in both the groups was affected by decreased vitamin D level; decrease in FEV1 was more pronounced among COPD patients compared to controls showing more expiratory airflow limitation. Vitamin D levels are associated with changes in lung

function in cases of COPD as well as healthy controls. Larger studies to confirm the association in Indian context are required and routine assessment of vitamin D may be undertaken to obviate the effects of low vitamin D level on lung function.

Compiled by **Dt. Priyanka Dhawan**, Assistant Dietician,  
Department of Dietetics, PGIMER, Chandigarh

## QUIZ

Department of Dietetics, PGIMER.

### 1. Which foods are high in vitamin D:

- a) Fatty Fish                      b) Romaine lettuce  
c) White Potatoes                d) Beets

### 2. The daily supplement of Vitamin D recommended by ICMR is:

- a) 200 IU/Day                      b) 400 IU/Day  
c) 600 IU/Day                      d) 800 IU/Day

### 3. Which of the following will increase in Vitamin D deficiency:

- a) The plasma concentration of prothrombin  
b) The plasma concentration of preprothrombin  
c) The plasma activity of alkaline phosphatase  
d) The plasma activity of acid phosphates

### 4. Which of the following results in poor absorption of Vitamin D:

- a) Wernicke-Korsakoff Syndrome                b) Ulcerative Colitis  
c) Celiac disease                                      d) Keshan disease

### 5. Vitamin D is essential for the formation of which enzyme for collagen formation in the bone matrix:

- a) Alkaline Phosphatase  
b) Adenosine- tri Phosphatase  
c) 25-OH-D-1-ALFA-hydroxylase  
d) Creatine Phosphokinase.

### 6. Vitamin D provides a potential for the treatment of the disease:

- a) Dermatitis herpetiformis                      b) Epidermolysis bullosa  
c) Psoriasis    d) Cheilosis

### 7. 1, 25 dihydroxycholecalciferol (calcitriol) works in conjunction with which hormone to achieve a normal blood calcium concentration and maintain calcium homeostasis.

- a) T3    b) T4  
c) Calcitonin    d) Parathyroid Hormone (PTH)

### 8. Vitamin D can be determined by a method called:

- a) Spectrophotometry                              b) Carr Price Reaction  
c) Colorimetry    d) Titration

### 9. The normal circulating plasma levels of vitamin D ranges from :

- a) 10-25 ng/mL                                      b) 10-25 mg/mL  
c) 25-80 ng/mL                                      d) 25-80 mcg/mL

### 10. Hydroxylation of Vitamin D undergoes activation in the liver when ultraviolet rays from the sunlight strike the skin and converts to :

- a) Calcitriol    b) Calcidol  
c) Ergocalciferol                                      d) All of the above

Answers : 1.(a) 2.(b) 3.(c) 4.(c) 5.(b) 6.(c) 7.(d) 8.(a) 9.(c) 10.(b)

### Answer Key (VITAMIN D –WORD SEARCH):

A B O N E M I N E R A L D E N S I T Y T E S T Y  
T P M E U I A F A A I G M M V C O L L A G E N V  
Y A H C S A C F R C A R I C K E T S N B F B E I  
D K E O S G E E T H L O E M G U Y C I E U O K S  
7 V R R M K F Y Y O V 7 T B O L N O O I F T G C  
D P G P I W B D S L V C L O F A E S W W P R E S  
E N O L L R C P W E T Y B H N K E T S H C T C I  
H S C S K P H E M C K B R B L A V E D N Y O B R  
Y W A U A P R F N A V H Y O D O M O B P S L M E  
D A L I N O L F I L L Y I W S Y F P T M B F G D  
R F C N D R P I P C C P P R P 7 D O K O S P B W  
O I I G M O 7 K S I T O M P 7 V I R D S C H 7 A  
C E F S I U W F F F O V 7 W W U T O K T E P D R  
H P E T L S F M B E H I T T M U B S G E E F F D  
O T R B K B S P O R N T A K H V K I O O W D O M  
L P O V P O M H N O U A T B A I U S W P Y K W E  
E 7 L S R N G M E L B M B O K T U V D E A S D L  
S C P T O E U D H T S I C Y B A K P Y N D H P L  
T S V E D S W R E D R N H K P M S T K I V P Y A  
E W T Y U K Y A A F C O T M S I W Y G A C M M N  
R U C A C A F E L O L S W I C N D P H 7 V H R B  
O 7 E H T O T V T D H I I M L D R D M N P T D Y  
L S D G S D A V H U D S Y 7 N A Y R G W D S 7 S  
Y T S D A M V L A N U N I M M U N E S Y S T E M

**HEALTH CAMPS:** The Department of Dietetics, PGI Chandigarh participated in a health camp organized by Satsang Adhiveton Kendra, Chandigarh at Kalibari temple premises on 24.11.2019 and in another health camp by Joshi Foundation, Chandigarh at Community Centre, Sector 15, Chandigarh on 15.12.2019. Diet counselling for various diseases with the help of diet charts was given to approximately 100 participants.



Health Camp at Kalibari Temple, Chandigarh



Health Camp at Community Centre, Sector - 15, Chandigarh

**NUTRITION COUNSELLING:** To create awareness among sportspersons, a lecture on Nutrition for Active Cricketers : Diet Before, during and after Competition was delivered by Dr Nancy Sahni, Dietician, PGIMER, Chandigarh at Cricket Stadium, Sector - 16 to all the sports persons from UTCA Cricket Association, Sector 16, Chandigarh on 5th December, 2019.



Lecture on Nutrition at Cricket Stadium, Sector-16, Chandigarh

**NATIONAL DIETETICS DAY:** Dietetics Day was celebrated with great enthusiasm by various institutions in very innovative ways for the residents of City Beautiful. The



Blood Donation Camp, Department of Dietetics, GMSH, Sector 16, Chandigarh

Department of Dietetics, GMSH, Sector 16, Chandigarh organized a blood donation camp on 09.01.2020 followed by a nutritional awareness programme for Moms and Moms to be. Diet charts were given to pregnant and lactating mothers on that occasion. Dr. G. Dewan, Director Health Services was the Chief Guest.

The Dietetics department of PGI, Chandigarh conducted a workshop under the theme "Reaching the Unreached" on the occasion of "National Dietetics Day" on 10th January 2020. Under this theme, around 50 pregnant and lactating mothers and their children attending Anganwadi Center at Sector-24, Chandigarh were apprised about Anemia and Vitamin A deficiency, its causes and consequences by displaying posters and pamphlets on the sources of iron and vitamin A. Snacks like Iron rich Pinni and vitamin A rich Gajjar Burfi were distributed among all the participants.



Community Outreach Programme at Anganwadi Centre, Sector - 24C, Chd., Conducted by Dietetics Dept. PGI, Chd.

The Government College of Yoga Education and Health, Chandigarh celebrated the National Dietetics Day on 10th January 2020 in its premises for the students, faculty, general public members and members of IDA, Chandigarh Chapter, including Ms. Manisha Arora, co-convenor of the chapter. Mrs. Lippi Parida, First Lady of Chandigarh graced the function as Chief Guest. Dr. (Mrs.) R. Puri, Founder President, Chandigarh Chapter was guest of honour. The message of National President was followed by a powerpoint presentation on nutrition and health, nutrition quiz, skit, recipe demonstration and recipe contest. Approximately 100 participants attended the programme.



**Yoga Session at Government college of Yoga Education and Health, Sector 23, Chandigarh**

In this endeavour, Department Dietetics of Ojas Super Speciality Hospital, Panchkula celebrated the Dietetics Day on 10.01.2020. by delivering a talk on **"Fats and Oils: Good or Bad"**

The celebration of National Dietetics day was not marred by the geographical boundaries of tricity. The IDA members of Chandigarh Chapter serving in neighbouring states also displayed their full enthusiasm. The Home Science department of DAV College, Yamuna Nagar celebrated Dietetics Day on 10.01.2020 by organizing a quiz, poster competition and powerpoint presentation on the role of diet in combating various diseases and increasing immunity, removing the problem of anaemia and staying fit by diet and exercise.



**DAV College for Girls, Yamuna Nagar**



**Department of Dietetics, Ojas Hospital, Panchkula**

**WORLD CANCER DAY** (04th February 2020): World Cancer Day was celebrated by organising a Diet Counselling Camp/ Clinic by the Department of Dietetics, PGIMER on 04.02.2020 at Radiotherapy OPD, New OPD, PGI, Chandigarh. Posters depicting cancer prevention, information on neutropenic diet and high protein diet were displayed. Pamphlets with healthy eating tips were distributed. Diet counselling on foods to be avoided and allowed was given to all patients. Approximately 100 patients and their attendants attended this special diet clinic.



**Diet Counselling Camp at Special Diet Clinic, Radiotherapy OPD, PGI, Chandigarh**



**Community Outreach Programme at Anganwadi Centre, Dadu Majra, Sector 38 (West), Chandigarh**

**COMMUNITY OUTREACH ACTIVITIES:** A community outreach programme was organized at Anganwadi Centre, Dadu Majra colony, Sector 38 (West), Chandigarh on complementary feeding practices on 25.02.2020. Approximately 100 mothers along with their children and 20-25 anganwadi workers/ helpers attended the programme. Vitamin A and Iron rich snacks like Palak Kachoris and nutritious Pinnis were distributed among all the participants.

# Act Now (Consume) To Zoom Your Way To Good Health With Vitamin D

Dr. Ritu Pradhan, Head and Associate Professor, Foods and Nutrition Department,  
Government Home Science College, Chandigarh.



## Vitamin D - Act Now (Consume) to Zoom Your Way To Good Health

<b>A</b>	ACT NOW (Consume)!! Anti-Inflammatory And Anti-Oxidative
<b>B</b>	Bone Health (Improvement)
<b>C</b>	Calcium Homeostasis /Ergocalciferol (D2)/Cholecalciferol(D3)
<b>D</b>	Destroys Free radicals/D2 (Ergocalciferol) /D3 (Cholecalciferol)
<b>E</b>	Effective Against Respiratory Tract Disorders/Ergocalciferol(D2)
<b>F</b>	Fat Soluble Vitamin/ Fatigue And Weakness Due To Deficiency
<b>G</b>	Generated Endogenously (Vitamin D3 Cholecalciferol)
<b>H</b>	25—Hydroxy Vitamin D (Efficient Way To Monitor Vitamin D Levels)
<b>I</b>	Improves Growth And Immunity
<b>J</b>	<i>Junk The JunkFood</i>
<b>K</b>	Kidney Stones Formation Due To Deficiency
<b>L</b>	Lipid Soluble Vitamin /Low Vitamin D ➔ Stress Burnout And Depression
<b>M</b>	Mental Illness(Mood Swings/Mood Disorders /Depression)Due To Too Little Vitamin
<b>N</b>	<i>Nutrition Facts (Check The Food Labels Before Consumption)</i>
<b>O</b>	Osteoporosis /Obesity Due To Deficiency
<b>P</b>	Prohormone Is A Substance That The Body Converts To Hormone. (7 DehydroCholesterol (In Skin) + Sunshine Cholecalciferol (Vit. D3) (Metabolises In Liver) ➔ Calcidiol (Metabolised In Kidney) ➔ Calcitriol (Active Form)
<b>Q</b>	Quintessential Vitamin
<b>R</b>	RDA For Vitamin D(400 I U Per Day) /Repairs Skin, Improves Growth And Immunity
<b>S</b>	SUNSHINE VITAMIN/Sources(Egg Yolk/Fish/Fortified Cereals And Dairy Products)
<b>T</b>	Tooth Decay (Prevention)
<b>U</b>	Ultraviolet B Rays Exposure (5-30 Minutes at least twice a week)
<b>V</b>	Vital For Calcium Absorption
<b>W</b>	Wavelength Exposure (290-320nm Of UV B Rays) For 5-30 Minutes at least twice a week + Walk/Workout (Outdoor)
<b>X</b>	<i>Xcuses No- Maintain Good Health</i>
<b>Y</b>	Yummy Yolk, Good Source Of Vitamin D
<b>Z</b>	<b>ZooooomYour Way To GOOD Health With Vitamin D!!</b>





## MUSHROOM TOFU MOMOS

### Ingredients :

Wheat Flour	60 gm	Mushroom	40 gm
Tofu	40 gm	Corn	20 gm
Onion	20 gm	Salt	As per taste
Black pepper	A pinch	Oil	3 tsp

### Filling :

Heat 2 tsp oil in a kadai. Cook the finely chopped above mentioned vegetables till half done. Add salt and black pepper as per taste. Turn off the flame and allow them to come at room temperature.

### Method:

In a bowl mix wheat flour, oil, salt, water to make a dough. The dough should not be too hard or too soft. Keep the dough for fifteen minutes at room temperature, then divide the dough into pea sized balls and roll it into thin sheets. Place a tbs of filling inside the sheet. Apply water on all the sides. Pleat them well into a shape of momos. When done, place momos in a steamer and steam it for 10 minutes on medium flame.

Serve hot with green chutney or tomato chutney.

**No. of serving: 2**

### Nutritive value

Energy	463 Kcals	Protein	14 gm
Carbohydrates	61 gm	Fat	19 gm

## BANANA OATS PANCAKE

### Ingredients :

Oats	25 gm	Egg	2
Sugar	10 gm	Banana (mashed)	1 ripe (medium size)
Cinnamon	A pinch	Baking powder	½ tsp
Vanilla essence	Few drops	Maple Syrup	Optional

### Method:

In a mixi jar, blend mashed banana, eggs, oats, baking powder and salt altogether. Blend the mixture till it is smooth and fluffy. Allow the batter to stand for 10-20 minutes in a fridge. Heat non stick pan over medium flame and spread a spoonful of the batter. Cook till golden brown from both the sides. Serve with a drizzle of maple syrup (optional) or fresh fruits of your choice.

**No. of serving: 2**

### Nutritive value

Energy	399 Kcals
Protein	15.6 gm
Carbohydrates	52 gm
Fat	15 gm

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