

Role of Yoga, Meditation and dietary Vitamin D on psychological and physiological health

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Abstract

Many studies indicate the benefits of Yoga, Meditation, and dietary Vitamin D interventions for mental and physical health. Yoga may be effective alone or along with medication or nutritive supplements to alleviate some medical conditions. In this regard, more research on large-scale, along with sufficient control, is highly encouraged because Yoga is relatively cost-effective and is also linked with added positive therapeutic effects. Vitamin D is also known as "sunshine" vitamin is an essential fat-soluble nutrient for healthy and strong bones, cell growth & also important for immune functions. The human body absorbs this vitamin primarily through sun exposure along with dietary supplements and certain foods sources having Vitamin D. It can also be interpreted that Vitamin D plays a role in exercise, physical, & mental health. In this article, the relationship between Yoga, Meditation, and dietary Vitamin D to maintain a healthy and stress-free lifestyle is discussed. The present article collectively discusses the benefits of Yoga, Meditation, and dietary Vitamin D interventions on mental and physical health, but more research is required to firmly validate such benefits.

Key Words: Yoga, Meditation, Vitamin D, Mental health, and Nutrition.

1. INTRODUCTION

Nowadays, one finds it very hard to make time for self. Everyone is in a hurry, but they do not have time to look after their own body & health. Therefore, today's fast-paced lifestyle requires a great need to harmonize mind, body, and soul. This can be done by taking out time from one's busy schedule and scheduling the daily activities. Technology and society are two faces of the same coin, which have positively and negatively impacted human lifestyle, yet we have to balance the two to lead a healthy life. Though we have become too dependent on technology, it is good in a way that technology eases our work, but it has also reduced the efforts or labor put in to do the task, which has a detrimental impact on our well-being. Furthermore, society is moving towards seeking medical advice for every problem. We are not against advancement in contemporary medicine but are against the 'pill for every disorder' concept that has been set up in society. A healthy lifestyle should have two pillars, 'moving and nutrition,' to ensure individuals have a healthy lifestyle bearing pill. This article highlights the role and influence of these two pillars of human life.

In our routine practice, we need harmony between mind, body & soul, and practice yoga to achieve inner peace and wellness. It makes it easy for the mind and the soul to decide and approve our actions. The balance between mind, body & soul increases consciousness of ourselves, the progression of our self-realization path, find the meaning of our lives, come forth from the fear of confusion, and feel a deep bond with both divine and every little thing around us. The inevitable stresses of life have less effect on us as we become balanced and harmonious. We act more consciously and become more meaningful, calmer & more relaxed in our relationships with people and situations. The relationship between body, mind, and soul is still far from understood. We humans typically live with one aspect (body or mind), but all three elements are linked together, and their harmonious interplay is important for holistic well-being. Thus, we must achieve harmony between mind, body, and soul. The routine practice of Yoga, Meditation, and Spirituality helps to achieve that. Yoga and Meditation are not only one-time practice or workout but rather a part of one's life over a period of time (Chung *et al.*, 2012). It not only influences the body deeply, but it also makes the soul relaxed and happy. The practice of yoga, deep breathing techniques, pranayama exercises, Meditation, and spirituality combine inner harmony and satisfaction, enhancing physical and mental life (Chung *et al.*, 2012).

Adopting a natural diet and lifestyle is another way to achieve harmony between mind, body, and soul (Jacobs, 2019). Spend more time outdoors and with nature. This new way of life encourages good health, removes impurities from your body, and helps us be content and safe despite our everyday difficulties and stresses. This allows you to find peace with your entire well-being with your body, mind, and soul. As our

ancestors have already said, "Fit Body" (Nirogi Kaya) is one of the seven happiness (such) for humanity. This happiness can be achieved only by the right balance between what we eat and what we do (Jacobs, 2019). Therefore, the government is trying to make fitness machinery accessible to the peoples in the surrounding parks and raise awareness about the role of Yoga and exercise among the general public (Figure 1).

The body obtains many nutrients from the food we eat, including carbohydrates, fat, protein, fiber, minerals, and vitamins; however, one nutrient is very important to bones and the body, but it has a low dietary source. That nutrient is Vitamin D or sunshine vitamin (Nair and Maseeh, 2012). It is now a well-known fact that our body needs sunshine vitamin to absorb calcium from food, bone formation, and other body functions. It has a crucial role in maintaining bone health, immune system, nerves, neuromuscular activity, cell growth regulation, and inflammation reduction (Holick, 2009). Furthermore, it can be used to protect against cancer, heart disease, stroke, diabetes, autoimmune disease, and depression, as shown in Figure 2. Many genes encoded with proteins that control cell proliferation, distinction, and apoptosis are partially only modulated by Vitamin D (Tabasi *et al.*, 2015). Vitamin D receptors (VDRs) are found in many cells, and they transform 25-D into 1,25(OH)₂D. Vitamin D enhances calcium uptake; because of insufficient levels of this vitamin in the body, bones may become thin and brittle (Nair and Maseeh, 2012). Body Vitamin D adequacy prevents adolescent rickets and adult osteomalacia (Jones, 2008). Along with calcium, it prevents osteoporosis in old adults.

Though naturally, only a few foods contain Vitamin D. Fish and fish liver oils provide one of Vitamin D's best sources; beef liver, cheese, and egg yolks contain small quantities. One cannot get a sufficient amount of Vitamin D, which the body needs only from a routine diet (Holick, 2009). The two main ways to get Vitamin D are to expose your skin to sunlight and to take supplements of Vitamin D. It should be discussed with a nutritionist first before taking Vitamin D supplementation. Only a nutritionist can find out how much Vitamin D supplementation is right for you. Though vegans can have an increased chance of low intake of Vitamin D, but that can be obtained through Vitamin D fortified foods (Radnitz *et al.*, 2015) or by having its supplements as prescribed by healthcare professionals.

2. IMPORTANCE OF YOGA/MEDITATION IN A HEALTHY LIFESTYLE

An eleven-year research study in the Universities of Coventry and Radboud concludes that the changes in molecular patterns that happen due to the mind-body interventions fight against physical and mental illness and promote overall health. Genes are activated due to this, resulting in proteins that affect the body, brain, and immune system (Buric *et al.*, 2017). Practicing Yoga daily allows people to achieve harmony, relaxation, discipline, fitness, pleasure, and a sense of peace. Yoga directly affects our way of life depend upon us, our body, and our goals. Meditation all about knows Me, Myself, looking inside, and moving on the path of self-realization. Thus, Yoga and Meditation can influence our lifestyle in several ways. Yoga helps decrease blood pressure, improves blood flow, strengthens muscle, and contributes to sleeplessness, particularly when relaxed (Park and Han, 2017). Yoga philosophy teaches you about healthy nutrition, particularly in Sanskrit, in terms of a '*sattvic*' diet. Yoga can also eventually lead to building self-esteem and self-confidence, which we all know is a secret to success and satisfaction to see such changes in you.

Physical wellness

Yoga has many physical benefits and can have a positive impact on our life. Regular yoga practice will strengthen our flexibility, resulting in our muscles (Ross and Thomas, 2010). According to the mayo clinic, Yoga helps enhance the therapeutic outcome, including various diseases, including cancer and chronic pain, reported in many studies. Yoga can also boost our sleep quality. Recent research published in 2020 showed that Yoga improved sleep quality among participants who have chronic insomnia (Wang *et al.*, 2020). Meditation brings peace and calm as part of Yoga. You then find harmony with the sense of balance from meditation. Concentrating on the breath in the practice of physical asana brings you peace. The daily meditation and yoga practice also increases patients' psychological well-being with a disease by decreasing stress and increasing immunity by increasing the cluster of differentiation 4 (CD4) counts.

Mental wellness

Yoga literally means "union" more specifically refers to the relationship between body and mind. If you are under stress, Yoga allows you to develop a better mental-welfare plan to boost your overall psychological condition. Symptoms such as anxiety and depression of mental health may also be minimized. Yoga allows

us to focus on the part of our nervous system that decreases our heart rate and the force of our heart's contraction (Pascoe *et al.*, 2017). All this allows you to live a stress-free lifestyle and relax. Yoga also helps to relax muscles, particularly in asana practice. Yoga gives muscle relaxation messages to the brain through neurotransmitters, which help to relax the body and mind. In Meditation, Yoga also helps quiet the mind and slow the breath and the pulse through practicing pranayama.

Spiritual wellness

Yoga practitioners believe that through Yoga, a variety of spiritual advantages can be accomplished. Yoga helps you build an attitude of non-judgmental, mindfulness and accepting actions toward your lives through different asanas, pranayama breathing techniques, and Meditation (Brown and Gerbarg, 2009). Yoga will help you on your journey of self-discovery. Practicing Yoga helps to develop harmony with life. This sense of balance is brought about through balancing postures, pranayama, and meditation. Balancing postures such as garudasana, help you focus on ajna chakra (a point of energy located at the forehead according to ancient texts) and bring balance into your day to day life (Csala *et al.*, 2020).

3. NUTRITION, DEPRESSION, AND MENTAL ILLNESS LINKAGE

Limited research and evidence are available for the nutritional-depression correlation, although the association between nutritional deficiencies and physical illness is recognized. As reported by Mathers; 2016, depression, bipolar disorder, schizophrenia, and obsessive-compulsive disorder (OCD) are widespread in many countries. As per Popa and Ladea, 2012, nutrition plays a key role in the severity and duration of depression. The new nutritional neuroscience area indicates correlation of nutritional factors with human understanding, behaviour, and their emotions.

Supplements containing amino acids have also reduced symptoms by converting them into neurotransmitters, which relieves stress and other mental health concerns (Marx *et al.*, 2017). In addition, the patient's symptoms have been reduced with daily supplements of vital nutrients. There have been recent reports that low serotonin levels are related to suicide. Lower levels of serotonin (neurotransmitter) may partially cause general insensitivity and cause impulsive violence and aggressive behavior, culminating in suicide. Researchers find the relationship between psychiatric illnesses and nutritional deficiencies (Reis and Hibbeln, 2006). Based on accumulated scientific evidence, nutritional supplement/treatment could be a promising therapeutic approach for treating bipolar syndrome, depression, schizophrenia, eating & anxiety disorders, attention deficit disorder (ADD)/attention deficit hyperactivity disorder (ADHD), autism, and addiction. One crucial fact is that for patients suffering from mental disorders, the risk of suicide is greater, and typically they take antidepressants and/or psychotherapy (Brown *et al.*, 1982). In several cases, long use or excessive doses can result in opioid toxicity, which may risk the patient's life. As of now, limited research data is available to suggest the best-recommended dose of nutritional supplements. However, based on previous and current active studies, psychiatrists suggest dietary supplement dosages accordingly and obtain results which are also monitored for further evidence (Marx *et al.*, 2017).

In a study, it has been revealed that selective serotonin reuptake inhibitors (SSRIs) inhibiting calcium absorption into bones, which could further lead to Vitamin D deficiency and osteoporosis. Considering this, patients suffering from mental illness and prescribed SSRIs medicines may also have an elevated risk of fracture (Moura *et al.*, 2014). Another psycho-neuroimmunology study tries to explain the link between diet, central nervous system, and immune function and how they influence an individual's psychological state (Rush). These results could lead to a greater acceptance for health professionals and health care practitioners who are treating depression and other psychological problems to the therapeutic benefit of dietary intervention.

LINKAGE BETWEEN VITAMIN D DEFICIENCY AND MENTAL HEALTH

The key role of Vitamin D has been explored in many aspects of human health, including mental illness, and numerous studies are still going on to find out the role of Vitamin D in other areas of health. Vitamin D receptors were found in several brain regions (Eyles *et al.*, 2005). The cell surface and genes inside the cell where they receive chemical signals are located with the receptors. Some brain receptors are Vitamin D recipients, which mean Vitamin D works in the brain somehow. Vitamin D has, therefore, been related to depression and other psychological disorders. The number of chemical substances called monoamines, including serotonin, is affected by Vitamin D (Eyles *et al.*, 2005). Researchers have also found that a significant proportion of monoamines can also be increased by Vitamin D relieving depression (Kjærgaard

et al., 2012; Yalamanchili and Gallagher, 2018). The Ca^{2+} levels start to increase in the cell as Vitamin D levels are declining, enhancing the onset of the depression.

Various studies have explored the link between Vitamin D levels & depression (Anglin *et al.*, 2013). A research study in Norway revealed more signs of depression are observed in people with low Vitamin D levels in their blood (Jorde *et al.*, 2008). This study also concluded that Vitamin D improved depression symptoms very effectively. A study in China revealed that in the people who had an ischemic stroke, the incidence of depression was much higher in the persons with low Vitamin D levels than those with its higher concentrations (Yue *et al.*, 2014). Similarly, one research in Sweden showed that suicidal people had substantially lower levels of Vitamin D than non-suicidal patients with depressive diseases (Grudet *et al.*, 2014). In another study conducted in the Netherlands, which had 1,102 people between the ages of 18 and 65 currently having the depressive disorder and 790 people having earlier, but not an active depressed disorder, it was found that Vitamin D levels were lower for the people with current depressive disorder. They lowered the severity of the symptoms for those who had a higher concentration of Vitamin D. A strong link was found in relation to levels of Vitamin D and the occurrence of depressing symptoms at a 2-year follow-up (Milaneschi *et al.*, 2014). Cross-sectional research in Finland has shown that depression and Vitamin D status are significantly associated (Jääskeläinen *et al.*, 2015).

4. NUTRITIONAL ASPECT OF DIETARY VITAMIN D

The human body makes Vitamin D itself once exposed to the Sun, but it can be challenging to make the sunshine a reliable source due to its dependence on the month of the year, time of day, cloud cover, sunscreen, age, and other factors. To live a disease-free and distress-free lifestyle, we must add Vitamin D to our diet. It helps boost the immune system, playing a crucial role in other body functions, decreasing the chances of some types of cancer, heart disease, depression, weight gain, and chronic health problems like multiple sclerosis (Holick, 2004).

There is a strong possibility between lower levels of Vitamin D and lethargy. However, Vitamin D is one of the essential vitamins for overall health. Still, many people doesn't receive sufficient Vitamin D, thus creating its inadequacy in the body, which contributes to a wide variety of health issues (Wang *et al.*, 2017).

Vitamin D: a unique vitamin

Vitamin D is the only vitamin that the human body can make itself, thus helping the body absorb calcium from the diet. Though in reality, it is not a vitamin but a hormone. Very few foods in nature are source of Vitamin D. The main source is sunlight still knowingly or unknowingly people are still deficient in this vitamin as they do not expose themselves to sunlight much thinking about skin tanning or non-availability of adequate sun light. Marwaha *et al.*; 2016, ^{mentioned} about the best time for sun exposure in a research, is between 11 am to 1 pm as the wavelength of ultraviolet B (UVB) rays is 290-320nm, which is important for the skin to synthesize active vitamin D. We do not get enough sunshine in today's lifestyle for the following reasons:

1. When you go outside, you still cover-up
2. You are in the house most of the time and do not go out often
3. If there is significant air pollution
4. If you are using lots of sunscreens or sunscreen above factor 8

We can take Vitamin D as the dietary supplement (only on your health care practitioner) because of the above-listed reasons if people are unable to get enough sunlight exposure. Vitamin D dietary supplements are also required for those who cannot produce adequate Vitamin D. An individual needs a supplement of Vitamin D because:

1. Having dark skin or hiding much of the skin in the summer outside
2. For all children between 6 months and 5 years, 7 micrograms to 8 micrograms of Vitamin D intake require per day recommended (Dalle Carbonare *et al.*, 2017)
3. Babies and young kids grow fast and hence need a lot of Vitamin D
4. Women who are pregnant and mothers who breastfeed need more vitamin D than other women
5. Older people are not so effective at producing Vitamin D because their kidneys become less efficient to convert Vitamin D to its active form
6. Children and teens who spend less time outside

7. People, such as working in store & office employees, engaged in their business, working in Information Technology field, housebound workers and housewives, night shift workers, etc. who spend less time outdoors in summer

If we do not have a sufficient level of Vitamin D, then the following consequence could be seen:

1. Children and babies may get rickets
2. Adults can develop osteoporosis or osteomalacia that causes bone pain
3. The risks of breast cancer or prostate cancer are also higher in adults
4. Increased numbers of individuals who have Type 1 diabetes, rheumatoid arthritis, weight gain, heart disease, and sclerosis
5. Depressive symptoms and mental disorders due to insufficient Vitamin D level

Vitamin D biosynthesis

It is a fat-soluble steroid hormone that is derived from dietary intake and also from sunlight exposure to synthesis via the skin. The majority of Vitamin D₃ or 25 hydroxyvitamins [25(OH) D] comes from conversion from the skin. A dietary intake, particularly plant or animal food, provides an alternate source. In general, Vitamin D₃ is present in animals, and fish and Vitamin D₂ are present in mushrooms (Holick, 2006). Vitamin D synthesized in the body by sunlight exposure to skin and from diet sources are either stored in adipose tissue or converted in the liver to 25-(OH) D. Metabolism of Vitamin D requires two hydroxylations to form its active form. The first hydroxylation is carried out in the liver, where Vitamin D is metabolized to 25 (OH) D. Then 25(OH)D binds to Vitamin D-binding protein (DBP) and makes 25(OH)D-DBP complex (Verroust *et al.*, 2002). The complex is converted by enzyme 25-hydroxyvitamin D-1 α -hydroxylase to its active form 1,25-dihydroxyvitamin (OH) 2D (Dusso, 2011), as shown in Figure 3.

5. RELATIONSHIP BETWEEN VITAMIN D, DEPRESSION, AND OTHER DISORDERS

Vitamin D deficiency increases concern in diseased persons and more likely to raises the risk of depression. Depression is a common mental disorder. According to the a recent report, more than 264 million people are suffering from depression worldwide (Liet *et al.*, 2019). During the depression, CD4+ cell count decreases, and viral load increases (Shi *et al.*, 2020). The risk of inadequate opioid treatment and increased mortality and morbidity has been found to be greater in individuals dealing with any disorder with depressive symptoms. Depressive symptoms for a long time proceed further to their severe stage through many mechanisms, including damage to subcortical areas of the brain, persistent stress, stigma, worsening social alienation, sorrow, weakening, and extreme demoralization (Zhai *et al.*, 2015).

The role of vitamin D supplementation during body infection is depicted in Figure 4. Vitamin D supplementation can be a simple and cost-effective way to increase the time for antiretroviral therapy required among HIV-infected patients (Mehta *et al.*, 2010). It has an important role in immune regulation (Hewison, 2012). It is reported that Vitamin D, with its receptors, works as an immune modulator (Villamor, 2006). Vitamin D induces the growth of monocytes, lymphocyte activation, and proliferation. Vitamin-D deficiency is expected to be a problem of public health in HIV affected African and South-East Asian sub-populations, where solar exposure is limited due to sociological and cultural restrictions (JM). On the other hand, over-activation of TNF- α might block the parathyroid hormone's stimulatory effect on the renal 1- α -hydroxylase (Haug *et al.*, 1998) (Figure 5).

World Health Organization (WHO) recent report estimated that 1.8 billion people are infected with *Mycobacterium tuberculosis* (MTB), which causes tuberculosis TB. Vitamin D mediates macrophage activation of the innate immune system that prepares the primary line for infection defense. Several studies have shown the effect on TB's acquisition and outcomes from TB infections by calcidiol levels, VDR polymorphisms, and Vitamin D supplementation. An increased risk of TB was identified among people with lower Vitamin D levels. Thus, Vitamin D supplementation appears to have a positive effect on patients suffering from TB. As per other concepts, human monocytes have receptors for 1,25 dihydroxyvitamin D that activates anti-mycobacterial responses. The active form of Vitamin D modulates the host response to *Mycobacterium tuberculosis* infection and induces antimicrobial peptides' production to decrease its pathogenesis.

Chronic kidney disease (CKD) has grown globally and more frequently in India as an important public health concern. CKDs often advance to end-stage renal disease (ESRD), which requires regular dialysis or renal replacement therapy (Ruggenentiet *et al.*, 2001). WHO reports that the number of deaths due to this disease was 864,226 (about 1.5%) worldwide in 2012 (Romagnani *et al.*, 2017). The age-adjusted ESRD

incidence rate is estimated to be 229 per million people in India, with over 100,000 new patients joining renal replacement programs every year (Modi and Jha, 2006). Nearly 35% of CKDs are Vitamin D deficient and require either calcitriol or cholecalciferol for the supplementation of Vitamin D. FGF-23 binds FGF-Klotho co-receptor complexes to promote phosphaturia in CKD patients, thus reducing 1,25(OH)₂D levels (Urakawa *et al.*, 2006). High FGF23 and sclerostin have non-target cardiovascular-based effects, increasing cardiovascular mortality in adult CKD patients (Scragg *et al.*, 2017).

Type 1 Diabetes Mellitus is a chronic autoimmune disorder typically triggered by T cell-mediated insulin-production destruction, with normal infancy and adolescence pancreatic β -cells. The global Type 1 Diabetes (T1D) incidence rate rises steadily, and accumulating data indicate that it is linked with a low level of Vitamin D (Hyppönen, 2010). On the other hand, it is shown that early-life Vitamin D supplementation reduces the risk of developing T1D (Mathieu *et al.*, 2005). For example, a sub-study showed that children receiving Vitamin D supplementation during their first year of life had a 33 percent less risk of T1D growth. Four major studies also found a substantially reduced risk of developing T1D in babies when Vitamin D supplementation is obtained (Zipitis and Akobeng, 2008). In addition, calcitriol or Vitamin D analogs in animal models have prevented or at least delayed diabetes (Nakashima *et al.*, 2016).

About 70 % of women in northern India have low Vitamin D levels and are thus at high risk of developing type 2 diabetes (Samson and Garber, 2018). Researchers indicated that in the case of Type 2 diabetes, there is an inverse connection between Vitamin D levels and blood glucose, indicating that the lower the levels of Vitamin D, the higher the blood sugar (Issa, 2017). This can be because the pancreatic beta-cell function can be directly affected by Vitamin D, which will increase insulin production, the researchers said. In the meantime, the *India Spend* report shows that India currently accounts for 49 percent of the world's diabetes burden, with 72 million cases estimated in 2017. By 2025, this number could nearly double to 134 million (Issa, 2017).

6. CONCLUSION

Yoga is as physical as it is mental and spiritual. Yoga and Meditation are meditative and spiritual activities that we should try to inculcate in our hectic everyday way of living. Even Yoga for beginners has all the benefits that we achieve in practice: mind, body, and soul. Practicing Yoga in life will help us in these three aspects of being harmonized with each other and show you how these elements are linked and complete the sense of being. Nutrient deficiency diseases cause energy imbalances and are increasingly evident in the relationship between diet and chronic disease. Globally, with expanded service life, the consequences of chronic diseases like type 2 diabetes, cardiovascular disease (CVD), HIV, tuberculosis, cancer, etc., are also raising morbidity and mortality. For example, diet and physical activity like Yoga/Meditation are obligatory in order to have a healthier lifestyle. Bones contain calcium, and for its better absorption by our body, Vitamin D is required. Vitamin D is related to bones and affects our entire body; the right balance of Vitamin D level in the body is a must for a healthy body, along with physical exercise (Yoga) and Meditation to reduce the chances of bone weakness and depression. In this way, Vitamin D and Yoga intervention, and Meditation could be a promising therapeutic approach towards mental and physical well-being and various chronic diseases.

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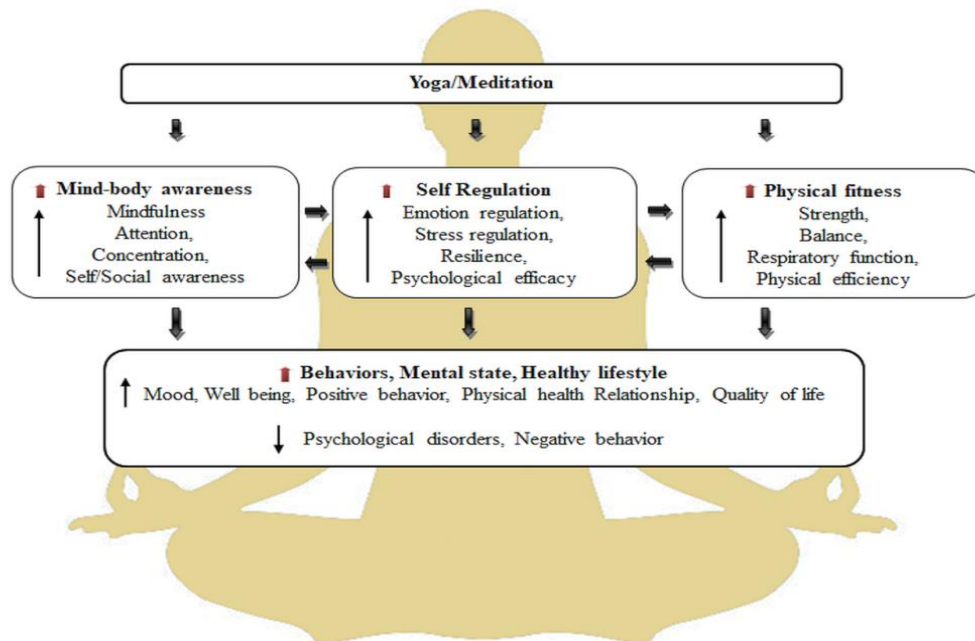


Figure 1: Effect of Yoga and Meditation on human lifestyle

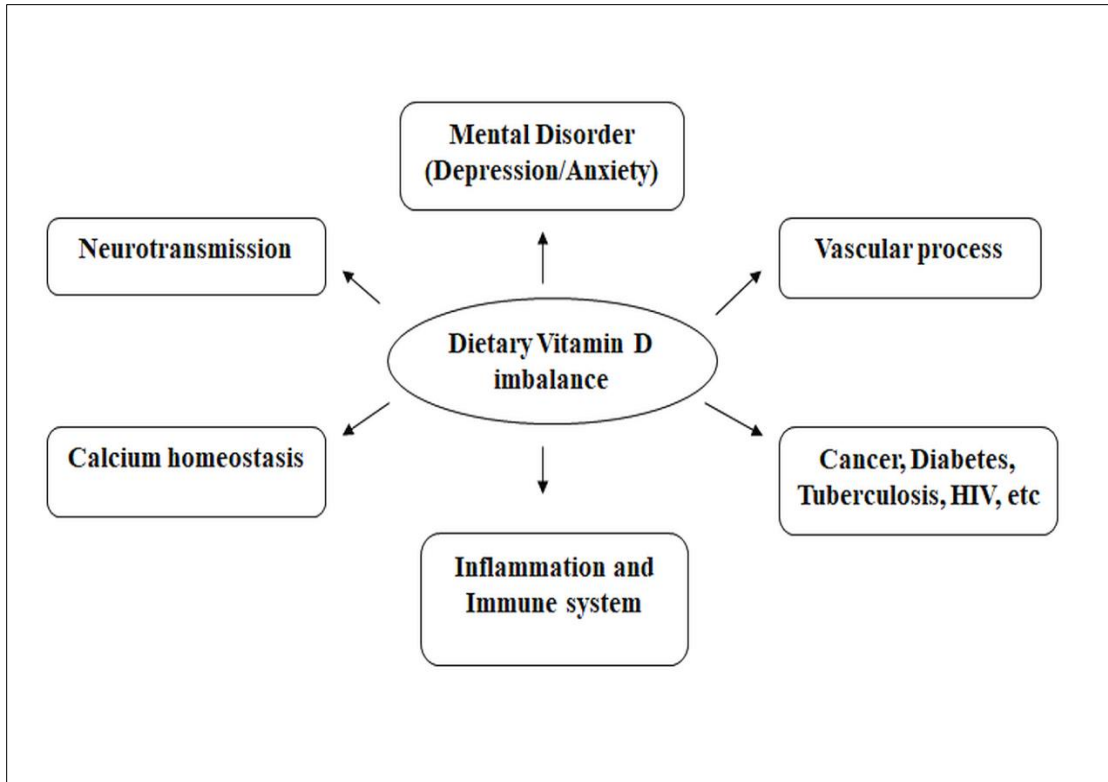


Figure 2: Effect of Vitamin D deficiency on Human Health

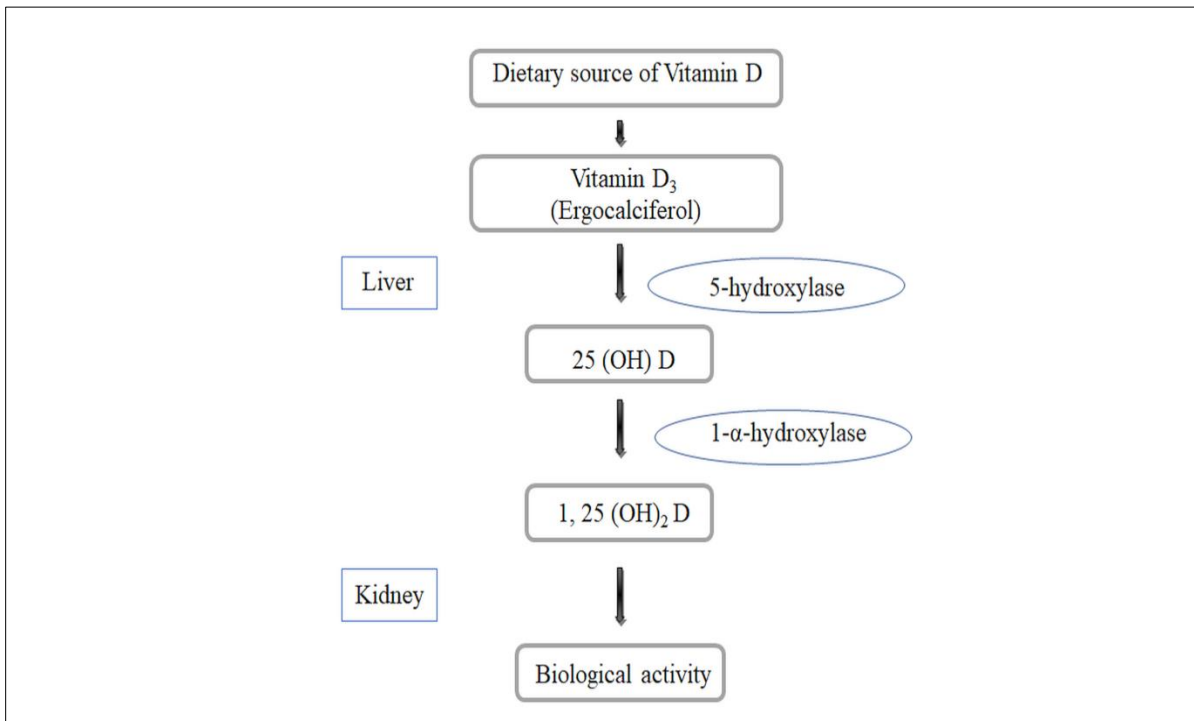


Figure 3: Process Biosynthesis of Vitamin D

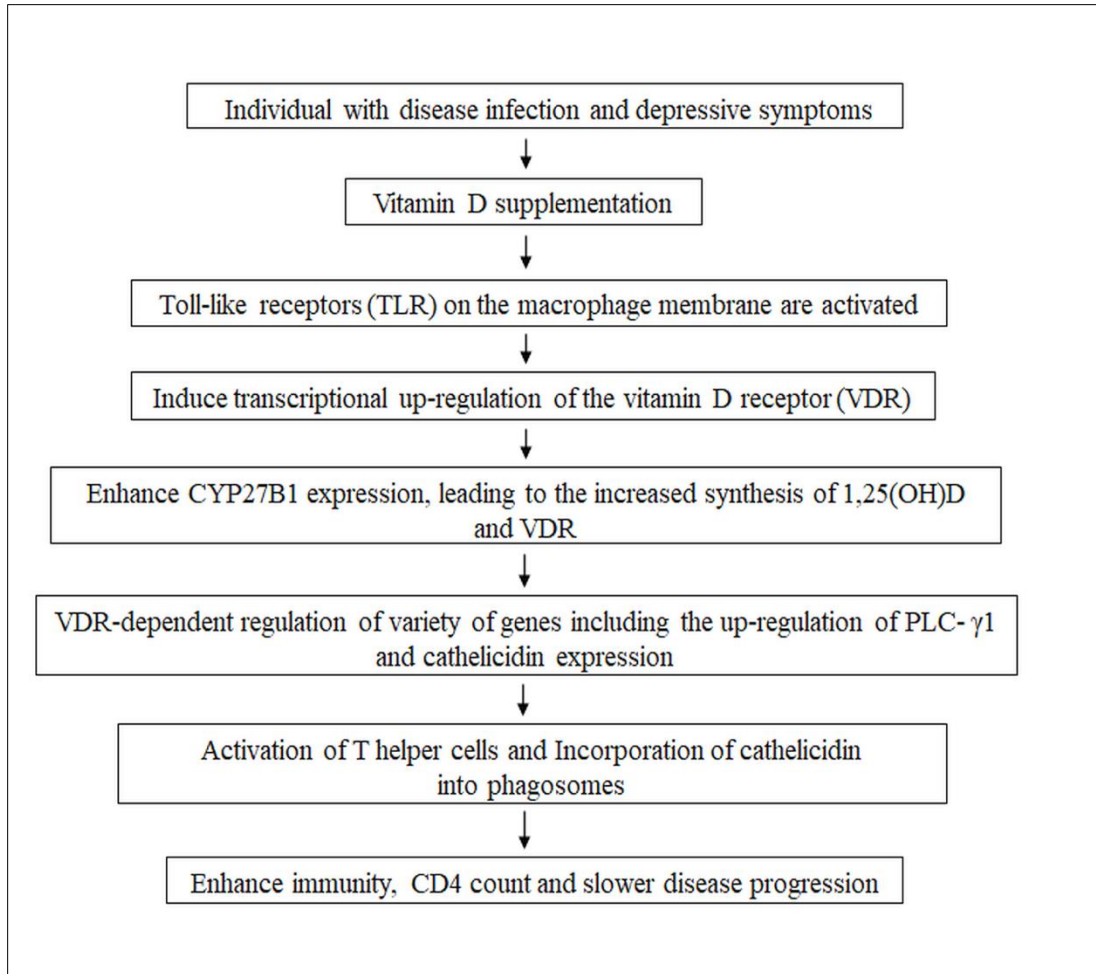


Figure 4: Role of Vitamin D supplementation duration the body infection

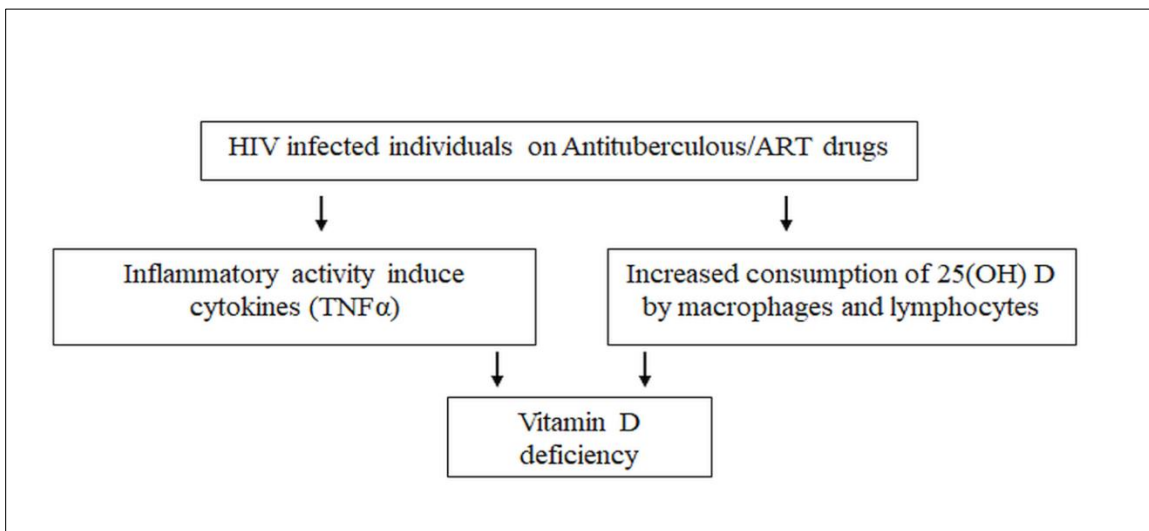


Figure 5: Vitamin D deficiency after HIV infection