



EVALUATION OF KNOWLEDGE, ATTITUDES AND PRACTICES OF VITAMIN D AND SUNLIGHT AMONG ADOLESCENTS

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ABSTRACT The present study “Evaluation of knowledge, practices of vitamin D and attitudes towards sunlight among adolescents” was conducted to assess the knowledge and practices of vitamin D and sunlight among adolescents. This study also focused on evaluating the attitudes of adolescents toward sunlight. A total of 100 students were interviewed for this study. The health status, dietary pattern and food energy intake of the subjects was assessed and it was seen that knowledge about vitamin D is above average and the source of knowledge is book and articles. Despite having good knowledge about vitamin D it was seen that some adolescents did not followed good practices for the absorption of vitamin D. Vitamin D is a secosteroid which means it is synthesized endogenously when human skin is exposed to UV-B rays. This is the reason it is also known as Sunshine Vitamin. Its insufficiency causes many metabolic disorders. Vitamin D deficiency is considered as a silent epidemic because its deficiency is also linked to other vitamins deficiency and if it is not treated on time it can cause great problems. Rickets and Osteomalacia are the deficiency disease which effects children and adults. Knowledge and practices about Vitamin D deficiency often goes unnoticed. Vitamin D also plays a great role in controlling gut health. In some muscles VDRs are present which expresses itself and improves gut microbiota. Being a neurosteroid hormone, helps in controlling some symptoms of Autism. In this study it was observed that people of different socioeconomic status have different levels of vitamin D. Their practices are also different from others. People who knows about Vitamin D even they also do not follow correct practices for good vitamin D levels in body. Adolescent of present era are smart and has more knowledge about diet and nutrients but they do not follow correct practices or do not follow healthy lifestyle. KAP study helps in analyzing the faulty practices followed by adolescents and gives suggestions and measure to overcome those problems.

KEYWORDS : Vitamin D, KAP study, secosteroid, deficiency, Adolescents.

INTRODUCTION

Vitamin D is essential micronutrient which helps in overall development of the body. It is fat soluble vitamin which helps in absorption of calcium and phosphorus and also helps in overall development of the bone and as it is a fat soluble vitamin it needs good percent of fat in body in order to function properly. Vitamin D is both a nutrient and hormone, it is also known as ‘Sunshine hormone’ as it needs sunshine. On exposure of sunlight skin absorbs ultraviolet rays and precursor of vitamin D which is present under the skin (7-dehydrocholesterol) is converted into active form of vitamin D (Calcidiol) and then to (Calcitriol). Cholesterol is necessary in activation of vitamin D. The production of Vitamin D is not an enzymatic process, its produced from precursor 7-dehydrocholesterol via a two step process. Skin pigment melanin blocks UV-B rays from reaching 7-DHC, thus limiting D3 production. From diet it can be obtained from fatty fish, mushrooms and nuts. The activation of vitamin D is initiated by three enzymes – 25 hydroxylation, 1 alpha hydroxylation and 24 hydroxylation. The former enzyme is found in liver and the latter two are found in kidney (Bikle D. D., 2014). Diagnosis of vitamin D can only be done by biochemical analysis, deficiency of vitamin D is not visible physically, so deficiency of vitamin D is considered as silent epidemic. It is more prevalent among children. Countries like Bangladesh are more susceptible to deficiency of vitamin D. In cross-sectional study of Kaliakoir district of Bangladesh, blood samples of children aged 0 month to 18 months were taken and analysed. The percentage of deficiency increased as children grew older. This showed that rural children are more effected due to deficiency of vitamin D and hypovitaminosis resulting in a silent epidemic in world (Ahmed, 2020). Immune cells- T cells, B cells, macrophages, dendritic cells expresses VDR and are able to produce and respond to calcitriol. Calcitriol lowers the anti-inflammatory properties. It enhances both innate immunity and adaptive immunity. Deficiency of vitamin D leads to risk of autoimmune disease (Adorini & Penna, 2008).

SERUM LEVELS OF VITAMIN D-

Less than 10ng/ml – deficiency
10-30ng/ml- insufficiency
30-100ng/ml – sufficiency
More than 100ng/ml – toxicity

RECOMMENDED DIETARY ALLOWANCES –

MEN & WOMEN – 600IU
PREGNANT WOMEN- 600IU
CHILDRENS- 400 – 600 IU.
OLDER PEOPLE- 600IU.

VITAMIN D is essential for brain development and its functioning. If there low vitamin D levels it will affect sleep, cognitive function and mood. Bone is mainly made up of calcium and phosphorus and vitamin D’s main function is to absorb calcium and phosphorus in our body. Vitamin D is good for heart. Low levels of vitamin D showed an increased risk of cardiovascular diseases. Low levels of 25(OH)D results in low levels of calcium which increases PTH hormone, this increase in PTH hormone initiates lipogenesis and decreases lipolysis and fat oxidation which in result increases lipid profile. 80 percent of our immune system is in our gut. Vitamin D deficiency results in dysbiosis and inflammation. The word Dysbiosis means that there is reduction in microbial variety and also the combination of loss of good or healthy bacteria like Bacteroides strains and butyrate producing bacteria and increase in pathobionts (these are symbiotic bacteria that become pathogenic under some conditions). VDR is expressed in IECs (Intestinal Enterocytes). Gut VDR plays a crucial role in protecting the integrity of the mucosal barrier.

HOW TO INCREASE VITAMIN D LEVEL

1. SUN – A person of fair complexion should sit 20-25 minutes in sun, and a person of darker complexion should spend 1 hour in sun. MELANIN is the pigment which blocks the absorption of vitamin D in darker complexion people. A person should sit in opposite direction of the sun with back facing the sun, because back has larger surface area and helps in good absorption of UV-B rays.

2. STRESS – Cortisol increases in stress and binds with receptors of vitamin D and thus leaves no receptors for vitamin D. So in stress vitamin D levels decrease

4. GOOD FATS – Cholesterol is the precursor of vitamin D, so low cholesterol or reduced intake of good fats in body means low precursor and low vitamin D levels in body.

STATINS a type of medication used in treating heart diseases which lowers cholesterols which results in low levels of vitamin D.

People those who are elderly, office workers, vegans, IBD patients are at risk of having low levels of vitamin D.

TOP 10 HIGH VITAMIN D FOODS

Fish, Mushrooms, Fortified milk, fortified soy milk, fortified tofu, fortified yoghurt, Fortified breakfast cereal, fortified orange juice, cod liver oil, eggs.

Deficiency disorders of vitamin D- Rickets, Osteomalacia, renal

rickets and hypophosphatemic rickets. Vitamin D deficiency is a major public health concern in all age groups worldwide. It is observed in those also countries where fortification has been implemented for years. Pregnant women are at risk because of the high demands of the child. Middle east girls are at risk of vitamin D deficiency (Gonzalez, 2014). Deficiency of vitamin D has many consequences; it is prevalent in almost all of the age groups. Consequences are like non communicable diseases. Obesity causes deficiency of vitamin D because of excess SAT (Subcutaneous Adipose Tissue). A study was conducted and it was seen that obese people had low serum levels of active vitamin D. And it is also seen that obese people cover their body more often than is why activation of vitamin D is reduced (Pourshahidi, 2015). Indian diet fails to meet the daily requirements of vitamin D so it is very important to fortify staple foods (Aparna, Muthathal, & Gupta, 2018). Vitamin D is vital for every organ of the body. It also effects neuronal and glial tissue of the brain. Deficiency of vitamin D also lead to dementia , schizophrenic like disorders (Anjum & Jaffery, 2018). Egg consumption on a daily basis improves serum levels of vitamin D but consuming egg daily will increase cholesterol levels and will lead to chronic lifestyle diseases. This theory was proved by a study done on middle aged people of Jiangsu province of China (Shi & Yuan, 2011). In a retrospective study of 217 obese children, 55.2% of patients were seen deficient of vitamin D (Tangorra & Gupta, 2007). Those people are overweight and obese are found to have lower levels of vitamin D. Sunbathing habits also effects the serum levels of vitamin D, this test was done on 367 persons. Obese people tend to spend more time indoors so there is no or little exposure of sunlight. And as the body fat percent increases, serum levels decreases (Kull, Kalikorm, & Lember, 2009). A study was done on rodents and it was seen that by increasing dietary calcium inhibits the hyper proliferation of the epithelial cells of colon. When a vitamin D deficient diet was given to rodents, increased the risk of hyper proliferation and hyperplasia in colon (Newmark & Lipkin, 1992).

Anthropologists studied that due to sedentary lifestyle there is decrease in bone quantity and quality and fracture resistance. However osteoporosis can be prevented by regular physical activity. Daily dose of 800 IU prevents the risk of osteoporosis. Levels of 25-hydroxyvitamin should be more than 74nmol/L (Vieth, 2005). Despite of good knowledge of use of vitamin D and calcium there is risk of rickets among children. This disease is more common in children of Nigeria, Ethiopia. Deficiency of vitamin D remains the major cause of rickets in infants as breastmilk is low in vitamin D, and social, cultural contexts and climatic conditions also prevent adequate sunlight exposure. Studies have also shown that toddlers and older children are also at risk of having rickets because of low dietary calcium. A study was done among Asian children and African and American toddlers, it showed that less calcium intake leads to catabolism of vitamin D and the development of Rickets (Pettifor, 2004). In cohort study vitamin D deficiency was seen to be associated with increased risk of surgery in Crohn's disease and hospitalisation in both Crohn's disease and Ulcerative colitis. Supplementation showed reduced frequency of relapses in patients with Crohn's disease ($p= 0.06$) (Mouli & Ananthkrishnan, 2014). Management of Ulcerative colitis and Crohn's disease is tricky process. Immunomodulation effect of vitamin D has a pathogenic influence in IBD. Deficiency of vitamin D is common among IBD patients (Nielsen, Hansen, & Gubatan, 2019). Patients who have IBD problem have low bone density, increased fractures due to low serum Vitamin D levels. In these patients Vitamin D supplementation is needed. In IBD vitamin D deficiency is very common. A study was performed on animals and it was seen that deficiency of vitamin D for longer duration increases susceptibility to dextran sodium sulphate. Vitamin D has immunomodulation effect and helps in strengthening innate immune system and reduces inflammation in body. Calcitriol the active form of vitamin D acts on dendritic cells and suppresses its activity and regulates the anti- inflammatory response. Autism is a developmental disorder that weakens the ability to communicate and interact. Numbers of evidences and researches have pointed about the possibility of gestational and early childhood vitamin D deficiency causes some causes of Autism. Vitamin D is neurosteroid hormone which is active in brain development Children who are autistic have low vitamin D levels. Supplementation of 5000 IU per day and 1000 IU in infancy reduces the incidence of autism (Cannell, 2017).

The need of vitamin D fortified foods has been increased in these few years, because of the civilisation sun exposure time is reduced, any kind of outdoor activity is reduced that is why serum levels of vitamin D is seen low among population. And due to low consumption of

vitamin D foods there is high need of consumption of fortified foods. Vitamin D fortified dairy products are launched in market (Babu & Calvo, 2010). Use of vitamin D fortified foods are used to reduce levels of malnutrition. Ready to use therapeutic foods (RUTF) are fortified foods with vitamin D. They were used as normal growth and development in severe acute malnutrition. Children upto 5 years of age were assessed after giving RUTF and possible positive changes were seen among children. Their z score also improved (Saleem & Zakar, 2018).

METHODOLOGY:

A KAP study was conducted in Lucknow area among urban population through questionnaire method. Total participants were 104 and each one of them responded. This study was conducted among adolescents so not everyone of them were interested but they filled survey form. Questions related to general and nutritional knowledge were asked and their attitude and practices were asked.

RESULTS AND DISCUSSION

The period of transition from childhood to adulthood is called Adolescent with accelerated physical, biochemical and emotional development. It is during the period that final growth spurt occurs. The growth spurt of the boys is slower than that of the girl. This study was conducted among adolescents of age group between 11 to 19, the responses which was collected was more from age group 17-18 and less from 12-15 age group, this not only shows the seriousness of filling a survey form but also they answered the questions correctly. Adolescents of age 12-15 showed lack of seriousness in filling the survey form. Female respondents showed more interest in filling the form, almost 55% female filled the form and only 45% men completed survey form. In this study respondents height range was 150 cm to 183 cm and weight range was 40 kg to 82 kg. Ideal weight for adolescents should be from 45 kg to 55 kg, but some of them were obese and some were underweight. Melanin content in skin hinders the synthesis of Vitamin D. Vitamin D is one of the important hormones in the body that plays an important role in many metabolic functions. Vitamin D is truly a remarkable, as in both forms (nutrient and hormone) it provides a wide variety of health benefits to human. The health benefits of vitamin D are beyond bone health. It is also considered as a drug of decade in pandemic. Vitamin D deficiency is a very prevalent medical problem that many people suffer from. In my study almost everyone was aware of vitamin D and the majority of students knew that sunlight is the source of vitamin D. However when students were asked about the synthesis of vitamin D in body from precursor, responses were equivalent among the students. After analyzing the results, we found that 90% of the adolescents stay indoors, so basically they are deprived of sun exposure which is considered the major source of vitamin D. Females have less vitamin D levels in their body because of the conservative female clothes. For those susceptible to vitamin D deficiency due to religious clothing. Older adults. Individuals with a dark skin tone or obesity, supplementations are required. To Among respondents 13% of them were of dark brown skin tone, 33% of them were beige skin tone and 43% of them were of fair skin tone. Fair skin tone means less or no melanin pigment which means UV-B rays gets easily absorbed and vitamin D is easily synthesized in the body. 1 among 104 respondents suffered from covid and others had typhoid, tuberculosis and thyroid problems.

In present study the common dietary patterns followed by the respondents were breakfast, lunch, dinner. In this study it was seen that 76% of the adolescents were aware about the balanced diet, macro and micro nutrients. 91% of them consumed milk and they preferred cow milk more than buffalo milk. Buffalo milk has more fat percentage as compared to cow milk. 55% of them were non vegetarian and 32% of them were vegetarian. 76% of respondents agreed that dairy products are good sources of vitamin D. Knowledge about vitamin D was good among adolescents and they answered all the questions correctly , around 98% of them agreed that vitamin D is good for health., but some of them were not aware about the basic facts about nutrition. This showed their lack of interest and awareness about nutrition. 77% of adolescents gained knowledge from books. 77% of them knew that vitamin D is made inside the body whereas 23% of them were not so aware about this fact.

Attitudes and practices were not so good among adolescents. Many of them used sunscreen but they did not checked SPF value before buying it. 51% of them used sunscreen. Almost everyone consumed milk, fish and nuts in their daily diet. This showed that they had optimal knowledge about vitamin D but their practices and attitudes regarding

diet and sun exposure was not so good. Adolescents are fond of gymming and home based workouts, they don't like going for early morning walk. Sun is the primary source of vitamin D but 12% of respondents had no idea of this fact. Outdoor activities help in more sweating and sun exposure also promotes formation of active vitamin D. This is the reason that 20 minutes of daily sun exposure is recommended for normal bone health. With regards to vitamin D and sunlight, the attitude of Asians is influenced by cultural and religious factors. UVR distribution and temperature are a major concern in the population who avoided sun exposure due to aesthetic reasons and fear of skin cancer. Growing evidences shows a physiologic role of vitamin D in many chronic diseases in addition to known effects on bone. It was hypothesized that half of the participants are not taking vitamin D supplement. Adolescents were not aware about the supplements and vitamin D fortified foods. 72% of them did not know about supplements and also did not use it and 62% of them did not consumed vitamin D fortified foods. Knowledge gap also exist regarding the potential physiologic impact of vitamin D deficiency in childhood on health outcomes throughout the life span. Weather conditions also affects vitamin D levels because some people restrict outings in summer or in day time. Weather conditions affect the practices of respondents towards sun exposure, so in this population supplements can be good alternative. Slowing down the increase through nutritional strategies, for instance, ensuring adequate calcium and vitamin D intake, is essential in reducing the burden of diseases like osteoporosis and rickets.

45% of the respondents used hats, umbrellas as protection from sun on daily basis and 49% used sunscreen. We estimated the level of knowledge about vitamin D and expected that the level of knowledge would be high but based on our result it was weak and significantly less than what we expected. Females were thought to be more knowledgeable regarding this and it came true in this study. Public education plays an important role in eliminating ignorance and biases towards calcium rich foods.

Furthermore, parents should take a proactive role in emphasizing the health benefits of maintaining a calcium and vitamin D rich diet to their children at different stages of their development. The right way to have vitamin D is always with a source of fat. It does not matter if we are chewing it, taking tablet etc. The good source of fats can be coconut oil, ghee, olive oil, nuts and seeds. Another option can be between meal which has a good amount of fat present in it. The dosage of vitamin D totally depends on serum levels of vitamin D in blood. Fish is an important source of vitamin D yet participants documented low consumption of it, so it should be added to their diet as it also has a cardio-protective role. Vitamin D deficiency is a worldwide health problem, but in present time food fortification is lacking. Supplementation with pharmaceuticals preparations is the only means of treatment of vitamin D deficiency. There is need for marketing and rational prescribing of the appropriate vitamin D supplements in healthy Indian population. In the present study it was found that the adolescent casually consumed the same food and followed the food pattern. So they need to be checked and taught about the food habits which should be followed at this stage to maintain their health.

SUMMARY AND CONCLUSION

In my survey I investigated the nutrients intake and eating practices of teenagers and their effect on their nutritional status. 104 adolescents who completed the survey were underweight, obese and with some other problems. We also found that the nutritional status of the adolescents also depends on various factors –

1. sex
2. income group
3. religion
4. education level of mother or father
5. food habit
6. size of family

The influences on the nutrition of adolescents were shown by different dietary disorders-

- Obesity
- Underweight
- Anemia
- Eating disorders
- Anorexia

The dietary errors from which a major percentage of adolescents

suffer-

- Skipping of meals
- Poor breakfast
- Eating junk food and snacking between meals
- Irregular eating habits
- Self-medication
- Use of drugs alcohol and smoking
- Less physical exercise

The basic concepts of nutrition about which the adolescents should be made aware are-

- Nutrition is the food, we eat and how the body uses it.
- Food is made up of different nutrients needed for growth and health and thus should be included in the diet in right amount and proportion.
- Age, sex, activity and status of health influence the amount of nutrients needed.
- All nutrients needed by the body is available through food.
- No food by itself has all the nutrients needed for full growth and health.

A finding of this survey shows the general trends regarding knowledge of vitamin D and attitude towards sunlight in young college students. Lack of consistency between knowledge and attitude and negative approach toward sunlight exposure, especially in girls was observed in this study, which may severely affect the vitamin D status of young college students. Implementing awareness campaigns and future health programs like a workshop or training at the college level may help in building more awareness and knowledge about the vitamin D importance. Potential interventions should be adopted from the government in terms of wide publicity of vitamin D as a next step to ensure this young segment of the population is acquiring adequate Vitamin D for optimal bone health. This study concludes that knowledge of vitamin D is low among all university students but slightly higher in females. Females agreed more they have vitamin D deficiency and take supplements more than males.

SUGGESTIONS

- The study was restricted to only 104 respondents due to shortage of time, it can be extended to whole adolescents of urban areas.
- A comparative study of adolescence of rural and urban areas can be undertaken.
- Vitamin D receptor is known to be associated with gut health and immune system of the body, but there are no proper researches regarding this. So, proper research is recommended in this field.
- Proper link between dietary Vitamin D and gut dysbiosis is not explained properly in some researches, there are very limited findings for this. Detailed research about this is recommended as it will open new study topics related to this.
- Proper awareness programs should be organized in rural area in order to improve vitamin D levels in rural population.
- Vitamin D helps in improving the core symptoms of Autistic children but there are limited researches regarding this. So proper research on this topic is suggested.

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