

Vitamin A in Human Nutrition

Dr. SAVITRI YADAV

Prof. B. N. RAMAN

It is a common belief that vitamins are a source of energy in our body. This is not true, for they do not provide energy themselves but help in release of energy present in proteins, fats and carbohydrates. Vitamins are essential food factors to be included in a diet for maintaining proper health and vitality. Term vitamin was coined by Casimir Funk in 1912 for a dietary factor, chemically a nitrogen containing substance 'amine', essential for life (Vita).

Vitamins are complex organic compounds required in a small quantity for normal growth and health. They play an important role in regulating numerous biochemical reactions in the cells of our body. These biochemical reactions are essential for growth and energy and are catalysed by enzymes present in the cells. Vitamins are co-factors for these enzymes and essential for their activities.

Vitamin A was the first fat soluble vitamin to be discovered. It is related to yellow coloured vegetable pigment present in carrots, yellow corn, mangoes, green leafy vegetables, tomatoes and papaya. This pigment is known as carotene and is a precursor of Vitamin A. In animal foods such as liver, butter, milk, cheese and eggs Vitamin A is present in a larger quantity in ready-made form. Vegetable oils as such do not contain Vitamin A.

It is a heat stable Vitamin. In customary cooking practices such as boiling, heating, and frying and baking to a moderate temperature for a short time, it is not destroyed. It is also quite stable to prolonged storage, moderate heat, weak acids and alkalies. If fat is rancid or kept in open air or exposed to ultraviolet rays Vitamin A is very rapidly destroyed.

All animals and human beings, to a large extent, fulfil their Vitamin A demand from carotene produced by plants. In human body a considerable quantity of ingested carotene is converted into Vitamin A and therefore inclusion of green leafy vegetables, carrots, tomatoes and papayas in diet is significant in preventing Vitamin A deficiency. All kinds of dietary fats help in absorption of Vitamin A and carotene in the small intestine. Absence of fat in a diet minimizes absorption and leads to Vitamin A deficiency. The blood brings absorbed Vitamin A to the liver and all other cells. When available in excess the liver stores Vitamin A for future need.

Functions

Vitamin A performs several functions in our body. It is essential for maintaining vision in dim light. The rods of the retina in our eyes contain Vitamin A and help us in seeing in dim light. It is our common experience that when we enter a cinema hall from a region of bright light to dim light we feel difficulty in seeing objects especially if the movie is on. After a lapse of time our eyes adapt to dim light and objects start appearing more clearly. This is called Dark Adaptation. In Vitamin A deficiency the eyes take longer time to adapt. This Delayed Dark Adaptation is the first and earliest sign of Vitamin A deficiency. In severe Vitamin A deficiency the eyes fail totally to adapt and Night Blindness ensues.

In addition to its role in dark adaptation Vitamin A helps in keeping other parts of the eyes such as cornea, conjunctivae, and tear producing organs healthy. In Vitamin A deficiency tear production stops making the eyes dry and prone to infection. Eventually, the cornea loses transparency leading to blindness.

Coverings of our skin, digestive, respiratory, genital and urinary tracts are made up of tiny epithelial cells. Vitamin A maintains integrity and health of these cells in outer covering and inner lining. In Vitamin A deficiency sweating stops altogether, the skin becomes dry and rough with full of cracks. A healthy skin is smooth and shining and offers a great resistance to bacterial invasion. Cellular resistance is greatly lowered in dry and cracked skin and the person becomes an easy prey for bacterial and parasitic infections. Doubtless to say, Vitamin A provides good protection against infections but excessive intake of it does not confer any additional immunity.

Vitamin A is essential for both bone and tissue growth. In a severe and prolonged Vitamin A deficiency during childhood the growth retardation is more marked and lasting. Vitamin A plays a very important role in production of sperms in males and ova in females. Prolonged Vitamin A starvation in famine and war victims is invariably associated with sterility in both the sexes. During pregnancy Vitamin deficiency affects foetal development very adversely and even may cause abortion.

Daily Requirement

Recommended Daily Allowance of Vitamin A varies with age, sex and physical state of the

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Dr. Savitri Yadav is on the Faculty of Medicine, University of Vienna, Austria. Prof. B. N. Raman is on the Faculty of Medicine, University of Khartoum, Sudan.

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C. Febrile Reactions: These reactions occur more frequently when equipment is reused, e.g., glass collection bottles, tubings, etc. The toxic substances in blood tubings and bacterial proteins are among the offending agents. Now with the invention of disposable equipment, this possibility is rare. However, febrile reactions do occur. The explanation for this seems to be the presence of antibodies directed against leucocytes. Another explanation in developing countries may be ill equipped hospitals and ignorant paramedical staff.

Prevention: 1. The patient should be informed during transfusion about this. 2. Administer antipyretics to persons who are known to have this reaction. 3. Transfusion with frozen washed packed cells may prevent this reaction. 4. See that the disposable, properly sterilised equipment is being used for transfusion.

Signs and Symptoms: Febrile reactions are characterized by: 1. Chills and fever that occurs an hour or more after the transfusion. 2. Headache, tachycardia and general discomfort may be present. 3. These symptoms may persist for 8-10 hours.

Nursing Intervention: 1. Discontinue the infusion of blood and notify the physician immediately. 2. The blood should be sent back to laboratory for re-examination for type and cross match as well as culture and sensitivity. 3. Treat the febrile reaction manifestations symptomatically.

D. Bacterial Reactions: These are caused by the transfusion of contaminated blood products and may prove fatal if not treated at once. The organisms which are commonly responsible for such type of reactions are: *Pseudomonas*, *Coliform*, *Achromobacteria*.

These bacteria liberate endotoxins. These reactions are very rare otherwise.

Prevention: 1. Aseptic collection technique should be used. 2. Change transfusion equipment frequently. 3. Do not keep the blood at room temperature unnecessarily. 4. Do not use blood that has been heated to above room temperature. 5. Do not prewarm infusions. 6. See for any haemolysis in the blood to be transfused.

Sign and Symptoms: 1. There will be fever. 2. Hypertension—which is very severe. 3. Pain in abdomen and peripheral parts of body. 4. Dry, flushed skin. 5. Vomiting. Bloody diarrhoea may be there.

Intervention by Staff Nurse: 1. Stop transfusion immediately and inform the doctor concerned if available. 2. Start broad spectrum antibiotics as directed immediately by the most rapid mode of administration. 3. Treat the bacteraemic shock. 4. Maintain the vital signs, fluid and electrolyte balance.

E. Circulatory Overload: Circulatory overload occurs when the blood or packed cells are administered too rapidly for the individual's cardiovascular system to respond to the additional volume.

Prevention: 1. The packed cells should be given to persons susceptible to circulatory over

load, e.g., infants elderly patients with cardiac or respiratory diseases. 2. There should be slow infusion with the patients in a sitting position. 3. J.V.P. and C.V.P. must be monitored.

Signs and Symptoms: 1. Tightness in chest. 2. Laboured breathing. 3. Dry cough. 4. Crepts at the base of lungs. 5. Pulmonary oedema. 6. Tachycardia.

Intervention by a Staff Nurse: 1. Stop or slow transfusion, depending on severity of symptoms. 2. Prop up the patient. 3. Vital signs are to be monitored. 4. Administer diuretics as ordered.

F. Air Embolism: The incidence of air embolism has been reduced by the use of plastic bags, but air may be introduced if the tubing is changed during the transfusion. Shock and cardiac arrest may ensue.

Prevention: 1. Avoid air into the infusion system. 2. If air is introduced, stop the infusion.

Signs and Symptoms: 1. Dyspnoea. 2. Cyanosis. 3. Shock. 4. Cardiac arrest.

Intervention of Nursing Staff: 1. Lower the head of the patient and turn the patient on left side. The air will collect in the right atrium where it can be gradually released to the lungs. 2. Treat shock. 3. Treat cardiac arrest if it occurs.

Follow-up of the Cases

1. The nurse should advise the patient who has experienced a transfusion reaction to relate this information to other nurses and physicians. 2. Measures to maintain a positive state of health should be taught to the patient who has a chronic disorder which requires periodic transfusion. 3. The patient should be advised to keep a neutral or written record of this and any other transfusion reactions. 4. It is also important to teach patients their blood groups and Rh types so that they too can be observant and knowledgeable during any future transfusions.

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body. An adult requires 5000 I.U. per day. In early childhood the requirement is about 1500 to 2000 I.U. and it increases with age and reaches maximum during adolescence—a period of active and rapid growth when requirement reaches to 6000 to 7000 I.U. daily. During pregnancy and lactation the body demands are higher, therefore, 6000 I.U. for a pregnant female and 8000 I.U. for a lactating mother is recommended.

Toxicity

If Vitamin A is consumed in larger quantity for a long period it is equally harmful to health. Once the liver and tissues get saturated and overloaded, the excess of Vitamin A in the body produces toxic symptoms such as loss of appetite, drying of skin, falling of hair, irregular bone growth, pains in bones and joints. Thus if Vitamin A deficiency is harmful excessive intake is more dangerous.

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