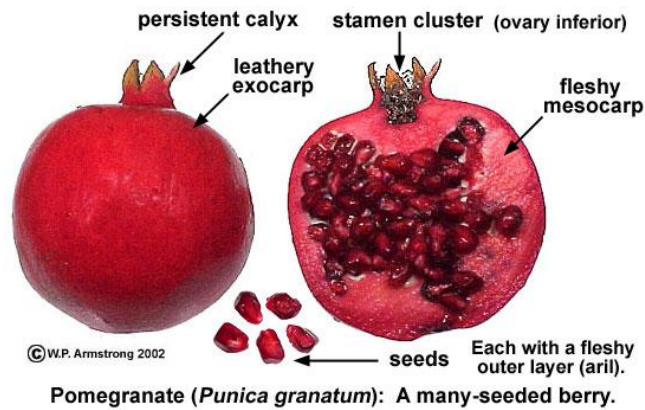


## Lesson no. 7 Pomegranate.



It is a fruit famous throughout the world for its taste, health benefits, easy available & cheap. Its Latin name is *Punica granatum* & its botanical family is Lythraceae. All parts of it are medicinal; it is mentioned in Quran & Hadith. In Hadith of Abu Nuaim it is mentioned that every Rumman (pomegranate) has one element of Jannah in it. Please read lesson no. 29 in part 2 page no. 15.

- **Quranic references of it: -**

1. Chapter no. 6 (An-am)verse no. 99 & 141
2. Chapter no. 55 (Rahmaan) verse no. 68.

- **Pomegranate tree: -**



It is deciduous (shedding annually its leaves & other parts which are no longer needed & they re-grow) round shrub of 5 to 10 meters long; it is grown in all mediterranean regions, there are many types of it; it requires less water & can survive drought (excessive dry & bad climate) condition for several years. It takes 5 to 6 years for the tree to mature & produce its fruit (pomegranate) though the tree can begin to fruit within a year of planting & in the first few years the fruits mature late or drop before maturing. It has multiple spiny branches; there are few fruitless varieties of it which bear flower alone. A good draining rich, fertile soil is ideal for its growth. The tree is adapted to cool winter & hot summer.

- **Leaves: -**



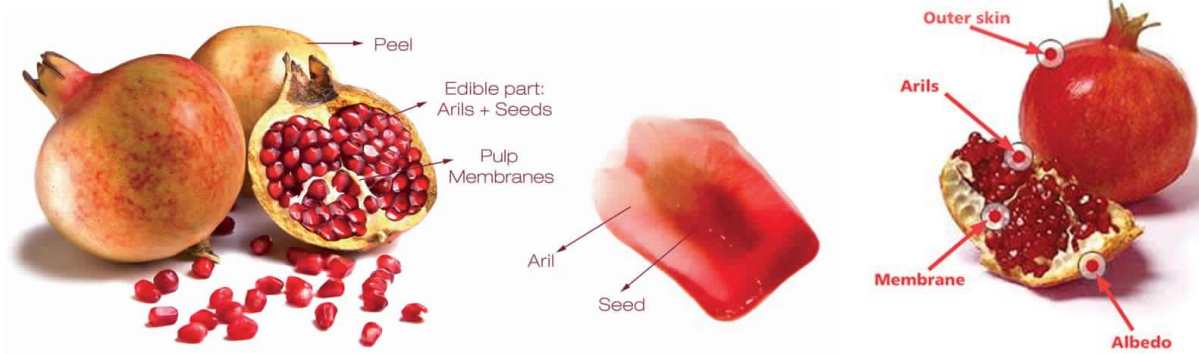
Its leaves are opposite, or sub opposite, glossy, narrow, oblong, entire shaped; size is 3.7 cm long to 2 cm broad.

**Flowers: -**



Its flowers are odorless, of white or bright red colour, size is 5 cm to 9 cm in diameter with 5 to 8 petals; flowers occur on 1 year old spurs or short branches, flower appears solitary (appear on spur), pair or in clusters (appear on terminal). The flowers are of 3 types; 1. Hermaphrodite flower- is vase shape, 2. Male flower- is bell shaped 3. Intermediate flower- is cylindrical or campanulate (narrow bell) shaped of reddish colour mainly, but sometimes yellow or white coloured. Hermaphrodite flowers are which have both female & male reproductive parts, they vase shaped, have a normal ovary capable of developing fruit & also has stigma; it is self pollinating but also insect pollinating. Male flowers are belly shape, it has poorly developed ovary & no pistil & is infertile & fall off without fruit set. Intermediate flower have long style or short style & has a developed ovary which is sometimes fertile may develop fruit set.

**Fruits: -**



It is of red-purplish colour, it is of different sizes depending of area of harvesting, shape is irregular round. The fruit has outer hard pericarp (exocarp), inner mesocarp (white albedo) & arils attached to albedo; the arils have juicy nectar & seeds inside it, there may be 200 to 1400 seeds in it, the fruit is produced from the ovary of a single flower. It has a lot of health benefits; the outer pericarp contains tannin which is helpful in stopping loose motions. The seeds also have lot of health benefits. 100 grams of fruit gives 83 calories.

- **Calories: -**

100 grams pomegranate gives 83 calories.

- **Contents of pomegranate: -**

**Arils: -**

Vitamin A, C, D, E, K, B1, B2, B3, B5, B6, B12, dietary fiber, sugar (fructose), protein little, folate, iron, magnesium, little sodium, potassium, calcium, magnesium, phosphorus, zinc, copper, selenium, manganese, tannin, ellagic acid (E.A), carbohydrate, ellagitannin (ETs) like punicalagin, anthocyanin of many types (delphinidin, cyanidin, pelargonidin) glycosides, poly-phenolic acids of many types (coumaric acid, chlorogenic acid, caffeic acid, gallic acid).

**Pomegranate juice: -**

Anthocyanin of various types, glucose, organic acids, vitamin C, EA, ETs, gallic acid, caffeic acid, catechin, quercetin, rutin etc.

**Flower: -**

Polyphenols, punicalagin, punicalin, ellagic acid (EA).

**Leaves: -**

Ellagic acid (EA), fatty acid.

**Root & bark: -**

Alkaloids, ellagitannin (ETs).

**Seeds: -**

Are rich in dietary fibers, also content carbohydrates, potassium, phosphorus, folate, vitamin B6, K, C, protein etc.

**Seed oil: -**

Punicic acid, palmitic acid, stearic acid, oleic acid, linoleic acid, catalpic acid, eleostearic acid, omega 6 fatty acid etc.

**Peel: -**

Luteolin, quercetin, kaemferol, gallagic, glycosides, punicalagin, punicalin, pedunculagin, ellagic acid.

- **Natural basic pharmacology of pomegranate & its parts, leaves, root, bark etc based on human intake in natural form: -**
- **Ellagic acid: -**

It is a natural phenol found in many fruits & vegetables. Plants produce ellagic acid from hydrolysis of tannins such as ellagitannin & geraniin.

**Main sources of ellagic acid: -**

White oak, red oak, walnut, grapes, strawberries, pomegranate, peach etc.

**Basic pharmacokinetics of ellagic acid: -**

Its absorption, metabolism & excretion are not known yet and are under research.

**Basic clinical pharmacology of ellagic acid: -**

It is powerful anti oxidant, prevents cancers & heart diseases.

- **Gallic acid: -**

It is also known as Trihydroxybenzoic acid, it is a type of phenolic acid; it is a group of hydrolysable tannins. It is used in pharmaceutical industries for various purposes.

**Main sources of gallic acid: -**

Tea, oak bark, strawberries, grapes, banana, clove, vinegar, gallnuts etc.

**Basic pharmacokinetics of gallic acid: -**

Its absorption, metabolism & excretion are not known yet and are under research.

**Basic clinical pharmacology of gallic acid: -**

It is anti viral, anti fungal, anti oxidant, prevents cancers of colon, prostate, leukemia without harming healthy cells, prevents neural disorders, anti inflammatory, asthma, allergy, rhinitis, sinusitis etc.

- **Ellagitannin: -**

It is specially present in pomegranate fruit, peel, bark, heart wood.

**Main sources of ellagitannin: -**

Pomegranate, walnut, strawberries, almonds etc.

**Basic pharmacokinetics of ellagitannin acid: -**

Its absorption, metabolism & excretion are not known yet and are under research. It is metabolized into urolithin in liver & excreted in urine. This urolithin inhibits prostate cancer & abnormal cell growth.

**Basic clinical pharmacology of ellagitannin acid: -**

It is anti cancer, anti oxidant, anti inflammatory; prevent prostate cancer, colon cancer.

- **Anthocyanin: -**

It is a type of flavonoid & is the pigments that give red, purple & blue plants their rich colouring.

**Main sources of anthocyanin: -**

Black soybean, pomegranate, black berries, cherries, grape, plums etc.

**Basic pharmacokinetics of anthocyanin: -**

Its absorption, metabolism & excretion are not known yet and are under research.

**Basic clinical pharmacology of anthocyanin: -**

It is a strong anti oxidant, anti cancer, anti inflammatory, removes free radicals from the body, prevents heart diseases, blood pressure, infections, urinary infections, cough & cold.

- **Delphinidin: -**

It is an anthocyanin found in pigmented vegetables & fruits. It is present in berries, pomegranate. It is anti oxidant, anti inflammatory. Very little is known about it yet.

- **Cyanidin: -**

It is a natural organic compound & type of anthocyanin; it is a pigment found in grapes, black berry, cherry, raspberry etc. it is anti inflammatory, anti oxidant, anti toxic, anti cancer, reduces free radical etc. Very little is known about it yet.

- **Pelargonidin: -**

It is an anthocyanin, a type of plant pigment; it prevents cardio vascular disease, obesity & improves vision, memory, and immune system. It is present in raspberry & pomegranate. Every less is known about it yet.

- **Punicalagin: -**

It is a type of phenolic compound, it is among ellagitannin. It is found in forms of alpha & beta pomegranate, it is water soluble. It is present in raspberries, strawberries, black berries & pomegranate. Every less is known about it yet.

- **Coumaric acid: -**

It is hydroxycinnamic acid belongs to non flavonoids phenol; it is present in following with caffeic acid kiwi, apple, coffee, grapes, blueberries, cereal grains etc. It is an anti oxidant, anti inflammatory, increases complexion. Every less is known about it yet.

- **Caffeic acid: -**

It is 3-4 dihydroxycinnamic acid; it is a type of polyphenol; it is anti oxidant, anti cancer, anti viral, anti inflammatory, boosts athlete performance, reduces blood glucose in diabetes, and reduces aging. It is present coffee, turmeric, thyme, cabbage, apple, mushroom, olive oil etc. Every less is known about it yet.

- **Omega 6: -**

It is a polyunsaturated fatty acid, it is also called as w-6 fatty acid or n-6 fatty acid; it is an essential fatty acid (our body needs it but cannot prepare it). The imbalance between omega 3 & 6 may lead to many health problems & heart problems.

**Main sources of omega 6: -**

It is present in egg, nuts, fish oil, whole grains, vegetables oil, flaxseed oil, grape seed oil, evening primrose oil etc.

**Basic pharmacokinetic of omega 6: -**

It is first hydrolyzed from eaten diet (mostly in triglycerides & phospholipids) by pancreatic enzymes, and then bile is secreted from gall bladder into intestines for further digestion (mostly in ileum). Linoleic acid is the parent compound of omega 6 fatty acid, during digestion & metabolism linoleic acid is converted into Gama linoleic acid & then into dihomo-gama-linolenic acid then into arachidonic acid then into adrenic acid. Its excretion is not yet known & is under research.

- **Basic clinical pharmacology of omega 6: -**

It is beneficial in asthma, arthritis, vascular disease, thrombosis, atherosclerosis, cancer, stroke; increase health of skin, nails, hair, bones, eyes etc, also heals the wounds. But if taken too much in diet can cause high blood pressure, heart disease, blood clots etc.

- **Oleic acid: -**

Its short hand notation is C18:1, it is a non essential (means it is produce naturally in the body) monounsaturated omega 9 fatty acid; It is insoluble in water & soluble in alcohol. It increases absorption of many drugs through skin by disrupting the lipids under the skin and penetration of the drugs, so its seed oil is best to be used with other applications on skin and used in cosmetic formulas.

**Main sources of oleic acid: -**

It is present in extra virgin olive oil is the best, also present in avocado oil, camellia oil, shea nut oil, apricot oil, sweet almond oil, whole egg, nuts, argan oil, pomegranate seed oil etc.

**Basic pharmacokinetics of oleic acid (based on human intake in natural food products): -**

It is believed that it is absorbed by different tissues mediated via passive diffusion to facilitate diffusion (this is under research) after taken up by the tissues it is stored in the form of natural triglycerides or oxidized, it is transported by lymphatic system; it is also believed to penetrate through skin (it is under research), its excretion is in stool. It is stored 98% in adipose tissues depots in form of triglycerides. Its metabolism & plasma half life is yet not known.

**Basic clinical pharmacology of oleic acid: -**

It increases bioavailability of following medicines cortisol, hydrocortisone, betamethasone, 17 benzoate betamethasone, 17 valerate (betamethasone), ketarolac (anti inflammatory), metronidazole, progesterone & estradiol.

Oleic acid prevents cardio vascular disease, blood pressure, skin disease, breast cancer, colon cancer, prostate cancer, stomach cancer, diabetes, gall stones, gastrointestinal disease and pancreatic disease. It reduces cholesterol, triglycerides, LDL, inflammation, swelling etc.

- **Linoleic acid: -**

It is a carboxylic acid; it is polyunsaturated with omega 3 & 6 fatty acids; its short hand notation is 18:2, it is an essential fatty acid that must be consumed for health.

**Main sources of linoleic acid: -**

It is present in olive oil, evening primrose oil, sunflower oil, walnut oil, hemp oil, grape seed oil, safflower oil, egg yolk, butter, pomegranate seed oil & etc.

**Basic pharmacokinetics of linoleic acid (based on human intake in natural food products): -**

It is first hydrolyzed from dietary fats & pancreatic enzymes & then with the help of bile it is absorbed in small intestine; metabolism & excretion are under research.

It gets converted into gamma linoleic acid (GLA) in the body, GLA is converted in the body into dihomo GLA (20 carbon chain) & it is converted into Arachidonic acid which is converted into Docosatetraenoic (long chain fatty acid with 22 carbons) acid.

**Basic clinical pharmacology of linoleic acid: -**

It acts on prostaglandin system of the body thus is anti-inflammatory, blood thinner, vasodilator (expand the blood vessel) it is very helpful in treatment of rheumatoid arthritis, breast lumps, fibro-adenoma (nodes in breast), cancers, reduces cholesterol, it prevents heart disease, diabetes, skin ulcers, irritable bowel syndrome etc.

- **Palmitic acid: -**

It is a common saturated fatty acid; it is the first fatty acid produced during lipogenesis (fatty acid synthesis) & from which longer fatty acids can be produced.

**Main sources of palmitic acid: -**

It is present in olive oil, flaxseed oil, soyabean oil, sunflower oil, palm oil, cocoa butter, meat, milk, pomegranate seed oil & etc.

**Basic pharmacokinetics of palmitic acid (based on human intake in natural food products): -**

Its absorption, metabolism & excretion are under research.

**Basic clinical pharmacology of palmitic acid: -**

It softens the skin & keeps it moist thus good for psoriasis & eczema. It coats the skin, it is powerful anti-oxidant; it maintains the health of hair & skin from aging, cleans them from dirt, sweat, excessive sebum (main cause of acne and boil on face & other parts of the body).

- **Stearic acid: -**

It is saturated fatty acid.

**Main sources of stearic acid: -**

It is mainly present in olive oil, also present in butter, whole milk, yeast bread, egg, pomegranate seed oil & etc.

**Basic pharmacokinetics of stearic acid (based on human intake in natural food products): -**

Its absorption, metabolism & excretion are under research.

**Basic clinical pharmacology of stearic acid: -**



It cleans the skin & removes dirt, sweat & excessive sebum from skin & hair.

### **Vitamin K: -**

It is a fat soluble vitamin; it is essential for normal blood clotting; it occurs naturally in two forms, vitamin K1 (phylloquinone) which is widely distributed in plants; Leafy vegetables are good sources of K1; vitamin K2 (menaquinones) is synthesized in alimentary tract by bacteria (Escherichia coli & other bacteria).

### **Main sources of vitamin K1: -**

It is present in olive oil & also present in green leafy vegetables (spinach, kale etc) cauliflower, cabbage, broccoli, sprout, fish, liver, meat, egg, cereals, pomegranate etc.

### **Basic pharmacokinetics of vitamin k (based on human intake in natural food products): -**

It is absorbed in small intestine, bile is required for its absorption & stored in fatty tissues & liver; it is excreted 40% to 50% in stools & 30% to 40% in urine.

### **Basic clinical pharmacology of vitamin K: -**

It acts on synthesis of certain proteins that are prerequisites (necessary) of blood coagulation (means act on stop bleeding) & body also needs it to control the binding of calcium in bones & other tissues. Deficiency of it makes bones weaker, calcification of arteries & other tissues thus take care of bones, joints & heart; it reduces tumour growth & is helpful in cancers.

- **Vitamin E: -**

It is fat soluble vitamin; it is a group of eight fat soluble compounds that includes four tocopherols & four tocotrienols.

### **Main sources of vitamin E: -**

It is present in olive oil, almonds, cereals, wheat germ, sunflower oil, corn oil, soybean oil, peanuts, green leafy vegetables, pomegranate & etc.

### **Basic pharmacokinetics of vitamin E (based on human intake in natural food products): -**

It is absorbed in small intestines & metabolized in liver & distributed through lymphatic system & stored in fat droplets of adipose tissue cells; it is mainly excreted in stool, little in urine & through skin.

### **Basic clinical pharmacology of vitamin E: -**

It prevents coronary heart disease, supports immune system, prevent inflammation, promotes eye health, lowers the risk of cancer; It is a powerful anti-oxidant thus reduces UV damage of skin, nourishes & protects the skin when applied on face; also promotes hair growth.

- **Vitamin D: -**

It is a fat soluble vitamin; it is a group of fat soluble secosteroids responsible for increasing intestinal absorption of calcium, magnesium, phosphate etc.

**Main sources of vitamin D: -**

It is present in olive oil, fish, liver, egg yolk, milk, salmon oil, orange, cereals, soy milk, legumes, pomegranate etc.

**Basic pharmacokinetics of vitamin D (based on human intake in natural food products): -**

It is absorbed in small intestines; it is mainly excreted in stools. All forms of vitamin D are biological inactive (body cannot use it directly) & get activated in liver & kidney by some enzymes; it is mainly of 2 types, 1) Vitamin D3 (cholecalciferol) 2) Vitamin D2 (ergocalciferol). Both can be ingested from diet.

Vitamin D3 is naturally synthesis from cholesterol by skin on sun exposure (UVB short radiations). It is converted in liver into Calcifediol (25-hydroxycholecalciferol) & kidney converts it into Calcitriol & this is biologically active (usable by the body). Vitamin D2 is converted in liver into (25-hydroxyergocalciferol).

**Basic clinical pharmacology of vitamin D: -**

It increases absorption in intestines of calcium, magnesium, phosphate & many other minerals; it acts on metabolism of calcium, phosphate thus promotes bone health & growth, promotes remodeling of bones in children; it reduces inflammation, improves cell growth, neuromuscular functions, immune function, prevents osteoporosis (pores in bones), rickets in children. Calcitriol binds with vitamin D receptors (VDR) which are mainly present in the nuclei of target cells. Its deficiency may cause rickets (mainly in children), weak bones, weakness in muscles, fatigue, headache, blood pressure, inflammation in mouth, skin pigmentations, obesity etc.

- **Potassium: -**

It is a mineral with symbol K & atomic number 19, it is an essential mineral which body cannot prepare; it is necessary for heart, kidney & other organs to function, its low level in body is called as hypokalemia & high level is called as hyperkalemia; it is mostly present inside the cells (intracellular); normal blood range is 3.5 to 5.0 milli equivalents per/liter (mEq/L).

**Main sources of potassium: -**

Potassium is naturally present in Banana, orange, dates, raisin, broccoli, milk, chicken, sweet potato, pumpkin, spinach, watermelon, coconut water, white & black beans, potato, dried apricot, beetroot, pomegranate, almond etc.

**Basic pharmacokinetics of potassium (bases on human intake in natural food products): -**

It is absorbed in small intestines by passive diffusion; it is stored mostly inside the cell, little in liver, bones & red blood cells. 80 to 90% potassium is excreted in urine & 5 to 20% is excreted in stools, sweat.

**Basic clinical pharmacology of potassium: -**

It is a mineral belongs to electrolytes of the body; it conducts electrical impulses throughout the body & assists blood pressure, normal water balance, muscle contraction, nerves impulse, digestion, heart rhythm, maintain pH balance. It is not produced in our body so we need to consume it through eating; Kidneys maintain normal level of it in the body by excreting excessive amount of it in urine or reabsorb it if the amount is less in the body so that the body may reuse it. Its deficiency may cause weakness, low blood pressure, constipation, nausea, vomiting etc.

Its normal amount in body keeps blood pressure normal; water balance in body normal; prevents heart disease, stroke, osteoporosis, kidney stone etc.

- **Carbohydrate: -**

It is a macronutrient needed by the body, the body receives 4 calories per 1 gram of it; carbohydrates includes sugar, glycogen, starch, dextrin, fibre & cellulose that contain only oxygen, carbon & hydrogen. It is classified in simple & complex; simple carbs are sugar & complex carbs are fibre & starch which take longer to digest. It is basic source of energy for our body.

**Main sources of carbohydrates: -**

It is present in watermelon (little), potato, sweet potato, bread, oats, butter, white rice, whole grain rice, pasta, lentils, banana, pineapple, beetroot, pomegranate etc.

**Basic pharmacokinetic of carbohydrate (based on human intake in natural food products): -**

Its digestion begins in mouth; salivary glands releases saliva & salivary amylase (enzyme) which begins the process of breaking down the polysaccharides (carbohydrates) while chewing the food; now the chewed food bolus is passed in stomach through food pipe (esophagus); gastric juice like HCL, rennin etc & eaten material are churned to form chyme in the stomach; the chyme now is passed little by little down into duodenum, pancreatic amylase are released which break the polysaccharides down into disaccharide (chain of only sugars linked together); now the chyme passes to small intestine, in it enzymes called lactase, sucrase, maltase etc breakdown disaccharides into monosaccharide (single sugar) & absorbed in upper & lower intestines, through villi present in small intestine & send into liver through venous blood present into portal veins, as per bodies need it is releases in the blood stream & pancreas release insulin to use it as source of energy for the body, & extra is stored is converted into glycogen by liver & stored in liver & little is stored in muscles & tissues. Liver can reconverts glycogen in to sources of energy if body lacks for other source of energy, the undigested carbohydrates reaches the large intestine (colon) where it is partly broken down & digested by intestinal bacterias, the remains is excreted in stools.

### **Clinical pharmacology of carbohydrates: -**

Carbohydrates are main sources of body energy, it helps brain, kidney, heart, muscles, central nervous system to function, it also regulates blood glucose, it acts on uses of protein as energy, breakdown of fatty acids & prevent ketosis. So it is an instant energy provider for the body & best for pre & post workout. If we eat less carbohydrate it may lead to hypoglycemia, ketosis, frequent urination, fatigue, dizziness, headache, constipation, bad breath, dehydration etc.

Excessive intake of carbohydrates may lead to vascular disease, atherosclerosis (leads to narrowing of arteries, stroke, diabetes, obesity, fatty liver, blood pressure etc.

- **Vitamin C: -**

It is also called as Ascorbic acid; it is an essential water soluble vitamin, very much needed by the body for many functions & absorption etc.

### **Main sources of vitamin C: -**

It is present in watermelon, citrus fruit, beetroot, broccoli, cauliflower, sprouts, capsicums, papaya, strawberries, spinach, green & red chillies, cabbage, leafy vegetables, tomato, cereals, pomegranate etc.

### **Basic pharmacokinetic of vitamin C (based on human intake in natural food products): -**

It does not need to undergo digestion, 80 to 90% of it eaten is absorbed by intestine cell border by active transport & passive diffusion & through ion channels it enters the plasma via capillaries. It is very little stored in adrenal glands, pituitary gland, brain, eyes, ovaries, testes, liver, spleen, heart, kidneys, lungs, pancreas & muscles. All together body can store 5 grams of it & we need 200mg/day in order to maintain its normal level & uses, but old, disease person, smokers & alcoholic need more daily value. It is excreted in urine in the form of dehydroascorbic acid changed by liver & kidneys both, but unused vitamin C is excreted intact.

### **Basic clinical pharmacology of vitamin C: -**

It prevent cough & cold, repairs tissue, acts as an enzyme for curtain neurotransmitter, important for immune function, it is a powerful antioxidant (donates electron to various enzymatic & non-enzymatic reactions); body prepares collagen with the help of vitamin c; it is also helpful in Alzheimer's, dementia, acts on iron absorption, it protects the body from oxidative damages, reduces stiffness of arteries, reduces tendency of platelets to clump each other, improves nitric oxide activity (dilatation of blood vessels) thus prevents high blood pressure & heart disease, also prevent eye disease, reduces risk of cataract, prevents the lining of lungs & prevents lung disease, it is a natural antihistamine (anti allergy), eliminates toxins from the body etc. Deficiency of it causes Scurvy disease (brown spots on skin occurs, swelling of gums, bleeding from all mucous membrane, spots are more on thighs & legs, the person looks pale, feel depressed, cannot move, loss of teeth, suppurative wounds occur.

- **Vitamin A: -**

It is a fat soluble vitamin; it is group of unsaturated organic compound that includes retinol, retinal, retinoic acid & several provitamin A carotenoid. There are 2 types of vitamin A, 1) Vitamin A: - found in meat, poultry, fish & dairy products; 2) Provitamin A: - found in fruits, vegetables, plants; beta carotene is common type of provitamin A; it is an antioxidant, reduces wrinkles & repairs the skin damages; it is available in the market as tretinoin in tablets & creams to heal acne.

#### **Main sources of vitamin A: -**

It is present in watermelon, beetroot, fish oil, carrot, green leafy vegetables, citrus fruit, sweet potato, spinach, kale, pomegranate etc.

#### **Basic pharmacokinetic of vitamin A (based on human intake in natural food products): -**

It is absorbed in jejunum mainly, little through skin; metabolism is in liver & excreted in urine & stools, it is conjugated with glucuronic acid & then changed into retinal & retinoic acid; retinoic acid is excreted in stool, mainly. It is stored primarily as palmitate in Kupffer's cells of liver, normal adult liver stores sufficient amount of it which is enough for 2 years for the body, little is stored in kidneys, lungs, adrenal glands, fats, retina; it is excreted in urine & stools.

#### **Clinical pharmacology of vitamin A: -**

it is needed by the body for vision and maintains eye health specially retina; it prevents night blindness; it helps in normal reproduction of cells thus prevents cancer; it is required for proper growth & development of embryo throughout the pregnancy period, it is good for skin, supports immune function; helps the heart, kidneys & lungs to work properly.

- **Vitamin B1 (Thiamin): -**

It is called as Thiamin also; it is a water soluble vitamin, it belongs to B-complex family, it is an essential micro nutrient which cannot be made by our body.

#### **Main sources of vitamin B1: -**

It is present in watermelon, spinach, legumes, beetroot, banana, wheat germ, liver, egg, meat, dairy products, nuts, peas, fruits, vegetables, cereals, rice, breads, oats, pomegranate etc.

#### **Basic pharmacokinetic of vitamin B1 (based on human intake in natural food products): -**

Intestinal phosphatases hydrolyze thiamin to make it free & absorbed in duodenum, jejunum mainly through active transport in nutritional doses & passive diffusion in pharmacological doses, very little is known about its absorption; it is metabolized in liver; it is excreted in urine & stored little in liver, heart, kidney, brain, muscles.

#### **Clinical pharmacology of vitamin B1: -**

It is needed for metabolism of glucose, amino acids (proteins), lipids (fats) etc; every cell of the body require it to form ATP (adenosine triphosphate) as a fuel for energy, also it enables the body to use carbohydrates as sources of energy; also nerve cells, heart cells, muscles cell require it to function normally; its deficiency causes beri-beri heart disease, weight loss, confusion, malaise, optic neuropathy, irritability, memory loss, delirium, muscles weakness, loss of appetite, tingling sensation in arms & legs, blurry vision, nausea, vomiting, reduce refluxes, shortness of breath etc; it is helpful to immune system; excessive intake of carbohydrates, protein, glucose (speacially in body builders, athletes etc) increases the need of vitamin B1.

- **Vitamin B2: -**

It is also called as Riboflavin, it is a water soluble vitamin, it is an essential micro nutrient, it helps many systems of the body; it is not synthesized in human body.

**Main sources of vitamin B2: -**

It is present in watermelon, liver, milk, dairy products, nuts, egg, fish, leafy vegetables, almonds, mushroom, lean meat and beetroot, pomegranate.

**Basic pharmacokinetic of vitamin B2 (based on human intake in natural food products): -**

It is phosphorylated in the intestinal mucosa during absorption; mainly absorbed in upper gastrointestinal tract; the body absorbs little from a single dose beyond of 27mg; when excessive amount is eaten it is not absorbed; very little is known about its absorption. The conversion of it into its coenzymes takes place mainly in cells of small intestines, heart, liver, kidneys & throughout the body in many cells; it is excreted in urine & stored little in liver, heart, kidneys & in tissues of the body.

**Basic clinical pharmacology of vitamin B2: -**

It is needed by the body to keep skin, eyes, nerves, red blood cells healthy, it also helps adrenal gland, nerve cells, heart, brain to function; it also act in metabolism of food, amino acids (protein), fats, helps to convert carbohydrate into energy (Adenosine triphosphate formation- the energy body runs on). It plays an important role in functioning of mitochondria.

Its deficiency is called as Ariboflavinosis & causes weakness, throat swelling, soreness of mouth & tongue, cracks on skin, dermatitis, anemia, weak vision, itching & irritation in eyes, migraine.

- **Vitamin B3: -**

It is called as Niacin or Nicotinic acid; it is in 2 forms niacin & nicotinamide acid; it is water soluble vitamin; it is an essential micro nutrient; it plays a role in over 200 enzymatic reactions in the body; It is produced in the body in small amount from tryptophan which is found in protein containing food & sufficient amount of magnesium, vitamin B6 & B2 (are needed to produce it).

**Main sources of vitamin B3: -**

It is present in watermelon, green peas, peanuts, mushroom, avocados, meat, egg, fish, milk, cereal, green vegetables, liver, chicken, coffee, potato, corn, pumpkin, tomato, almonds, spinach, enriched bread, carrots, beetroot, pomegranate etc.

**Basic pharmacokinetic of vitamin B3 (based on human intake in natural food products): -**

If eaten in natural form it is absorbed in stomach & small intestines by the process of sodium-dependent carrier-mediated diffusion in 5 to 20 minutes; if taken in therapeutic doses get absorbed by passive diffusion in small intestines. Its uptake in brain requires energy, in kidneys & red blood cells requires a carrier. It is metabolized in liver in 2 ways either is conjugated with glycine or niacin is form into nicotinamide; it is stored little in liver unbounded to enzymes. It is excreted in urine.

**Basic clinical pharmacology of vitamin B3: -**

It regulates lipid level in the body; it acts on carbohydrate to form energy sources for the body, it ease arthritis, boost brain function, every part of body needs it to function properly, it helps convert food into energy by aiding enzymes & cellular metabolism, it acts as an antioxidant. It prevents heart disease. Deficiency of it causes pellagra, high blood cholesterol, memory loss, fatigue, depression, diarrhea, headache, skin problems, lesion in mouth, tiredness etc.

- **Vitamin B5 (pantothenic acid): -**

It is also called as pantothenic acid, it is water soluble vitamin, it is a micro nutrient, it is necessary for making blood cells; acts to convert eaten proteins, carbohydrate, fats into energy; it is a component of coenzyme A; it is used in synthesis of coenzyme A. (coenzyme A acts on transport of carbon atoms within the cell).

**Main sources of vitamin B5: -**

It is present in watermelon, beetroot, meat, chicken, liver, kidney, fish, grains, milk, dairy products, legumes, pomegranate etc.

**Basic pharmacokinetic of vitamin B5 (based on human intake in natural food products): -**

It is converted into free form by intestinal enzymes & in nutritional doses it is absorbed in intestinal cells via sodium dependent active transport system in jejunum & pharmacological doses are absorbed by passive diffusion; after absorption the free form of it is now transported to erythrocytes via plasma, in cells pantothenic acid is converted into CoA, all the body tissues can convert it into CoA & ACP (acyl carrier protein), after these two complete their jobs they are degraded to form free pantothenic acid & other metabolites. It is excreted in urine & stools & little in exhaled in carbon dioxide.

**Basic clinical pharmacology of vitamin B5: -**

It promotes skin, hair & eyes health, proper functioning of nervous system & liver, formation of red blood cells, making of adrenal hormones, sex hormones; it is very helpful in constipation, rheumatoid arthritis, acne, allergies, asthma, baldness, colitis etc.

Its deficiency causes fatigue, nausea, vomiting, irritability, neurological weakness, numbness, abdominal cramps, sleep disturbances, hypoglycemia etc.

- **Vitamin B6: -**

It is also called as pyridoxine; it is involved in many aspects of macronutrients metabolism; it is present in many food products naturally.

**Main sources of vitamin B6: -**

It is present in watermelon, chicken, bread, egg, vegetable, soyabean, whole grain cereals, brown rice, fish, legumes, beef, nuts, beans, liver, citrus fruits, starchy vegetables, potato, beetroot, pomegranate etc.

**Basic pharmacokinetic of vitamin B6 (based on human intake in natural food products): -**

It is absorbed in small intestines, but before absorption a phosphate group has to be removed making vitamin B 6 in free form & absorbed by passive transport, now reaches liver via portal vein, in liver to get metabolized & flown into the blood stream it is bound with albumin & some are taken up by red blood cells, once getting in blood it can function & promote health & it is excreted mainly in urine & little is excreted in stools, it is very little stored in tissues, muscle tissues, liver, brain, kidneys, spleen.

**Basic clinical pharmacology of vitamin B6: -**

It is needed for proper development & function of brain in children; it is needed for neurotransmitter, histamine, haemoglobin synthesis & function. It serves as coenzyme (cofactor) for many reactions in the body, it is the master vitamin for processing amino acids & some hormones, it is needed by the body to prepare serotonin, melatonin & dopamine, it is better to intake it during treatment of tuberculosis. It supports adrenal glands to function; it acts as a coenzyme in the breakdown & utilization of fats, carbohydrates, protein, it is important for immune system, it helps in treatment of nerve compression like carpal tunnel syndrome, premenstrual syndrome, depression, arthritis, high homocysteine level, diabetes, asthma, kidney stones etc.

Its deficiency causes seborrheic dermatitis (eruption on skin), atrophic glossitis with ulceration, conjunctivitis, neuropathy, anaemia etc.

- **Folate (vitamin B9): -**

Folate is an essential micro nutrient, it is a natural form of vitamin B9, it serves many important functions of the body, it plays an important role in cell growth & formation of DNA, RNA & other genetic



material & helps in treating many diseases; its name is derived from the Latin word *Folium*, which means leaf, leafy vegetables have it in good amount; Folic acid is a synthetic form of vitamin B9.

**Main sources of folate: -**

It is present in watermelon, dark green leafy vegetables, fruits, nuts, beans, dates, seafood, egg, dairy products, meat, chicken, legumes, beetroot, citrus fruits, broccoli, spinach, cereals, pomegranate etc.

**Basic pharmacokinetic of folate (based on human intake in natural food products): -**

Its absorption is complicated because folate present in food are of many different forms, some of which cannot be absorbed until broken down by intestinal enzymes; it is not absorbed more than 50%; dietary folate contains glutamate that need to separate it from glutamate before absorption starts; It is absorbed in duodenum & jejunum, after absorption it is converted into tetrahydrofolate (the active form of folate), then a methyl group is added to it to form methyltetrahydrofolate; now the body uses it for various functions & metabolism; the body can store folate 20-70mg in liver which is enough for 3 -6 months for the body; it gets excreted in urine & little in stools & bile.

**Basic clinical pharmacology of folate: -**

It is needed by the body to make DNA, RNA & other genetic material; it prevents many disease & conditions like anaemia, stroke, cardiac diseases, cancers, neurological diseases, macular degeneration (eye disease), palpitation, sores in mouth & tongue, hair fall, graying of hair. It is important in fertilization in male & female, essential during pregnancy to prevent neural tube defect in embryo (it is needed more), it protect us from free radicals & oxidation thus prevent cancers, it is essential in red blood cells formation, reduces high levels of homocysteine.

Its deficiency may cause anaemia, tiredness, palpitation, breathlessness, hairfall, neural tube defect in baby during pregnancy etc.

- **Sodium: -**

Here we are learning natural sodium, its symbol is Na & atomic no. 11; it is not produced in the body we need to take it in food sources; it is an important & essential mineral on which our body functions; it regulates blood pressure, blood volume etc.

**Main sources of sodium: -**

Excessive intake of sodium should be avoided; it has very less amount of sodium in it; also vegetables & fruits have less sodium in them which is good for the body. It is present in beans, meat, fish, chicken, chilli, bread, rolls, milk, celery, beetroot etc.

**Basic pharmacokinetic of sodium (based on human intake in natural food products): -**

It is absorbed in ileum by active sodium transport because it is impermeable & in jejunum absorption takes place via mediated active transport & depends on levels of water, bicarbonate, glucose, amino

acids etc; its absorption plays an important role in the absorption of chloride, amino acids, glucose & water; similar mechanism are involved in the reabsorption of it in kidneys when its level in the body falls. It is excreted mainly in urine, little in sweat & stools. It is stores in bones & dissolved in various body fluids.

#### **Basic clinical pharmacology of sodium: -**

It is amongst the essential electrolyte within the body, it remains in extracellular fluid (outside the cell) mainly, it carries electrical charges within the body, kidney maintain its normal level in the body, normal level is 135-145 milli-equivalent per liter (mEq/L), it is not produce in the body, it acts on muscles contraction, nerve cells, regulates blood pressure, blood volume; it takes part in every function of the body mostly, its low level in body is called as hyponatremia, it is found more in older aged, kidney disease, heart disease, hospitalized patient, this condition may cause brain edema, low blood pressure, fatigue, tiredness etc; its high level in the body is called as hypernatremia may cause increase in blood pressure, thirst, confusion, muscle twitching or spasm, seizures, weakness, nausea, loss of appetite, swelling in body etc.

- **Calcium: -**

It is natural essential mineral for the body, it is among the electrolytes of the body; its symbol is Ca & atomic no. 20.

#### **Main sources of calcium: -**

It is present in watermelon, milk, banana, cheese, green leafy vegetables, soya beans, nuts, fish, meat, egg, bread, flour, yogurt, almonds, kale, soybean, spinach, beetroot, pomegranate etc.

#### **Basic pharmacokinetics of calcium (based on human intake in natural food products): -**

Calcium is absorbed in duodenum & upper jejunum (when calcium intake is low) by transcellular active transport process, this depends on action of calcitriol & intestinal vitamin D receptors & when calcium intake is high, absorbed by paracellular passive process throughout the length of small intestine by 3 major steps, entry across the brush border, intracellular diffusion via calcium-binding protein & extrusion; Vitamin D is necessary for absorption of calcium, also vitamin C, E, k, magnesium & exercise increases the absorption of calcium. Also the level of calcium is regulated by calcitonin released by thyroid gland it reduces calcium level in blood when it is excessive & increases the excretion of calcium via kidneys; Parathyroid hormones (PTH) released by parathyroid gland increases the blood level of calcium when body need it or calcium is less in blood & promotes reabsorption of it in kidneys (calcitonin & PTH both have opposite function). Intestines can absorb 500 to 600 mg of calcium at a time; it is mostly stored in bone tissues & teeth & excreted in stool & sweat & little in urine depended upon the level of it in blood. Also estrogen act on transport of blood calcium in bones thus women mostly suffer from osteoporosis after menopause.

#### **Basic clinical pharmacology of calcium: -**

Calcium acts on bone health, communication between brain & other parts of the body, muscles contraction, blood clotting; it is a co-factor for many enzymes, it relaxes the smooth muscles & blood vessels; it maintains heart rhythm, muscles function; it is more needed in childhood & deficiency of it in childhood may cause convulsions (seizure); Excessive level of it in blood is called as hypercalcemia & may lead to kidney stone formation, heart attack, stroke, loss of appetite, excessive urination, memory loss etc; its low level in blood is called as hypocalcemia & may lead to cramps in the body, weak bones, weak teeth, numbness, tingling etc.

**Contraindication: -**

Sarcoidosis, excessive level of calcium in blood, very severe constipation, kidney stones, increased activity of parathyroid gland etc. Hypersensitivity of calcium, severe cardiac diseases, hypercalcemia, hypercalciuria, severe kidney stones etc.

- **Iron: -**

It is an essential mineral for our body; its symbol is Fe & atomic no. 26; it is an important component of hemoglobin (hemoglobin binds oxygen in lungs & supply it to whole body, it is oxygen carrier).

**Main sources of iron: -**

It is present in watermelon, meat, dates, spinach, egg, nuts, dark leafy green vegetables, broccoli, pumpkin seeds, chicken, legumes, fish, banana, cabbage, kidney, almonds, beetroot, pomegranate etc.

Meat is the best source of iron, it provides Fe<sup>+2</sup> directly which can be transported from intestine to blood stream through Fe<sup>+2</sup> transporter ferroportin (this binds with transferrin & delivered into tissues).

**Basic pharmacokinetics of iron (based on human intake in natural food products): -**

The absorption of iron is not known fully; about only 10% of iron taken in food is absorbed; it is absorbed in duodenum & upper jejunum mainly & at the end part of ileum; low pH is needed for its absorption, after absorption it get bind to transferrin (each transferrin can carry 2 atoms of iron); ceruloplasmin (protein) also helps in binding of iron; Heparin a hormone produced by liver is released when iron stores are full & inhibits iron transport & binding, thus reduces the absorption of iron; vitamin C & copper enhances iron absorption.

**Storage of iron: -**

Iron is stored in liver (in hepatocytes & kupffer's cells) kupffer's cells play an important role in recycling body iron, they ingest aged RBC liberate iron for it & reuse by breaking down hemoglobin. Little iron is stored in liver, heart, & kidneys in form of ferritin also little in bone marrow, spleen.

**Excretion of iron: -**

The body does not possess a physiological mechanism for regularly eliminating iron from the body because most of it is recycled by liver cells; iron is lost within cells, from skin & interior surface of the body (intestines, urine, breathe).

#### **Basic clinical pharmacology of iron: -**

It is an important component of Haemoglobin (haemoglobin bind oxygen in lungs & supply it to whole body); iron is beneficial for nails, hair, skin etc; it acts on blood production, its deficiency causes Anaemia (low haemoglobin level in blood) (this causes reduced in oxygen carrying capacity & supply of it); most of the iron is present in haemoglobin, it consist of one heme (iron), one protein chain (globin) this allows it to bind & load oxygen from the lungs & supply it to whole body.

Unbounded or free iron is highly destructive & dangerous it can trigger free radical activity which can cause cell death & destroy DNA.

- **Magnesium: -**

It is an important essential mineral; its symbol is Mg & atomic no. 12; it is a co-factor for more than 300 enzymes that regulates functions in the body. Its normal range in blood is 0.75 to 0.95 millimoles (mmol)/L.

#### **Main sources of magnesium: -**

It is present in watermelon, spinach, beetroot, meat, egg, nuts, dark leafy green vegetables, broccoli, pumpkin seeds, dates, chicken, fish, legumes, pomegranate etc.

#### **Basic pharmacokinetics of magnesium (based on human intake in natural food products): -**

It is absorbed about 20 to 50% only; it is absorbed about 40% in distal intestine when the level of it is low via passive paracellular transport & about 5% in descending colon when the level of it is high via active transcellular transport. Vitamin D increases its absorption & also acts on its excretion in urine. It is excreted in urine & stool; it is stored in bones.

#### **Basic clinical pharmacology of magnesium: -**

It is a co-factor for more than 300 enzymes that regulates functions in the body. It act on protein synthesis, muscles & nerve function, blood glucose, control blood pressure, it is required for energy production, bone development, synthesis of DNA & RNA. It also plays a role in active transport of calcium & potassium ions, muscles contraction, normal heart rhythm etc.

- **Phosphorus: -**

It is an essential mineral; its symbol is P & atomic no. 15, it is needed for many parts & functions of the body.

#### **Main sources of phosphorus: -**

It is present in watermelon, beetroot, pomegranate, meat, nuts, beans, fish, chicken, dairy products, soy, grains, lentils etc.

**Basic pharmacokinetics of phosphorus (based on human intake in natural food products): -**

It is absorbed 70-85%, it is absorbed 30% in duodenum, 20% in jejunum, 35% in ileum; it is absorbed in inorganic phosphate form by 2 separate process first when the phosphorus intake is high mainly after meals by paracellular sodium independent passive diffusion pathway & second is transcellular sodium dependant carrier-mediated pathway this falls under the control of vitamin D & etc. When calcium level is too high in the body phosphorus is less absorbed, optimum calcium : phosphorus ratio is helpful in its absorption (excess of anyone decreases the absorption of both). It is stored in bones 85% & rest in tissues; it is excreted 80% in urine & rest in stools (excretion of it is a regulatory action of parathyroid hormone (PTH), vitamin D, and fibroblast).

**Basic clinical pharmacology of phosphorus: -**

It is present in nature combined with oxygen as phosphate. It acts on growth of teeth, bones, repairs of cells & tissues. It plays an important role in metabolism of carbohydrate, fats, protein & ATP. It works with B-complex vitamins & helps kidney function, muscles contraction, normal heart beats, nerve impulse etc.

- **Zinc: -**

It is a trace mineral; symbol is Zn & atomic no. 30; it is necessary for human body as it plays vital role in health.

**Main sources of zinc: -**

It is present in watermelon, meat, fish, legumes, beans, egg, dairy products, seeds, nuts, whole grains, beetroot, pomegranate etc.

**Basic pharmacokinetics of zinc (based on human intake in natural food products): -**

It is absorbed 20 to 40%, its absorption depends on its concentration & is absorbed in whole intestines (jejunum has high rate of its absorption) via carrier-mediated mechanism, it is released from food as free ions during digestion. Zinc from animal sources is easily absorbed comparing to plants sources. It is present in bile & pancreatic juices which is released in duodenum & is reused by the body this is called as endogenous zinc & zinc present in food sources is called as exogenous zinc. Its absorption depends on 2 proteins- Albumin & metallothionein. Albumin enables zinc to be transported from plasma into enterocytes. It is stored in muscles, bones mainly & little in prostate, liver, kidneys, skin, brain, lungs, heart & pancreas. It is excreted in stools 80% & rest in urine & sweat. Metallothionein binds to zinc to make it unavailable & excrete it in stools when zinc is excess in the body, & production of metallothionein is reduced when zinc is less in the body to make zinc available for the body.

**Basic clinical pharmacology of zinc: -**

It is necessary for immune system, prevents skin diseases, heal skin diseases, helps stimulate activity of at least 100 different enzymes in the body; it is required in little amount in the body, but children, pregnant & old aged need it more. It promotes growth in children, synthesize DNA & acts on wound healing, it is best in treating initial diarrhea & cold cough. It is ideal during motions. It also improves learning, memory, fertility etc. It heals acne, attention deficit hyper activity disorder (ADHD), osteoporosis, pneumonia etc.

- **Manganese: -**

It is an essential mineral & micro nutrient, needed by the body for proper health. Its symbol is Mn & atomic no. 25.

**Main sources of manganese: -**

It is present in watermelon, nuts, beans, legumes, brown rice, leafy green vegetables, pineapple, beetroot, pomegranate etc.

**Basic pharmacokinetics of manganese (based on human intake in natural food products): -**

It is absorbed 40%, it is absorbed more in women than men; if intake of it is more, than absorption is less & if intake is less, absorption is more; its absorption takes place in small intestines, after absorption it is bounded to blood protein transferring & transmanganin & transport via blood stream to tissues; it is absorbed by inhalation & dermal (skin) also; it crosses brain blood barrier. It is stored in bones, liver, kidney, pancreas; it is excreted mainly in bile & stools, little in urine & sweating; unused manganese is transported to liver for excretion & excreted via bile mainly.

**Basic clinical pharmacology of manganese: -**

It is needed for proper health of skin, bones, cartilage etc; it helps in glucose tolerance, regulates blood sugar, reduces inflammation, reduces premenstrual cramps, it also aids in formation of connective tissues, bones, sex hormones, blood clotting, metabolism of carbohydrates & fats; it facilitates calcium absorption.

- **Sugar (fructose): -**

Sugar present in it is fructose; (but diabetic patients should not eat much of it).

**Main sources of fructose: -**

It is present in watermelon, honey, banana, apple, mango, cherry, strawberry, orange, kiwi, pears, pomegranate, apricots, carrots, yogurt, bread, lemon, lime, green beans, beetroot, pomegranate etc.

**Basic pharmacokinetics of fructose (based on human intake in natural fruit & food products): -**

Fructose digestion begins in the small intestine (more in upper jejunum) via active transport or facilitated transport (not known properly). Our body cannot absorb intact polysaccharide molecules.

Therefore, if fructose is present in the form of sucrose, sucrase, an enzyme, must first break up sucrose into separate glucose and fructose components. Single fructose molecules then enter the lining of the small intestine through a special channel and exit out the other side into the bloodstream, once in the bloodstream, fructose travels with all other absorbed nutrients to the liver for metabolism and processing.

### **Metabolism: -**

Fructose metabolism occurs entirely in the liver. Through a complicated process called fructolysis, fructose undergoes several chemical and structural changes with the help of aldolase B (an enzyme in the liver).

Extra fructose needs to be changed into glycogen by liver & stored in liver, once the storage is full in liver then liver convert it into triglycerides & triglycerides are further converted by liver into very low-density lipoprotein (VLDL) & stored in fat cells & muscles. Excessive fructose is excreted in urine.

### **Basic clinical pharmacology of fructose: -**

Fructose has low glycemic index & results in moderate release of insulin in the blood stream relative to glucose & sucrose; fructose gives the least dental caries among other types of sugars, fructose is more sweeter than other types of sugar; it does not raises blood sugar much as glucose does, it is used as sources of energy in the body, excessive intake of it may cause fatty liver, metabolic disorder, blood pressure, increase lipids, increase in uric acid level, increase in free radicals etc.

- **Dietary fibre: -**

It is an eatable part of vegetables & fruit; our body cannot digest it just passes the small intestines & colon & excrete in stools; it is of two types 1) soluble fibre 2) insoluble fibre.

Soluble fibre dissolve in water & form a gel like material & helps in controlling blood cholesterol & blood glucose; it is found in apple, carrot, barley, oats, peas, beans watermelon etc.

Insoluble fibre do not dissolve & promotes excretion & increase bulk of the stool thus relief constipation & helps in elimination of toxins also. It is found in wheat flour, beans, cauliflower, potato, green beans, watermelon, beetroot, beet leaves, pomegranate etc.

This is the reason it is helpful in constipation conditions, it can eaten in pregnancy to relief constipation and get other benefits of it also.

### **Basic pharmacokinetics of dietary fibre (based on human intake in natural food products): -**

Soluble fibres get dissolve in water & become a gelatinous substance; do not get digested; it helps to slow the digestion & help the body to absorb vital nutrient from eaten food.

Insoluble fibres do not dissolve in water but remain in fibrous form, and do not get digested; it helps the food pass through the digestive sytem and increase the bulk of stool & eliminate toxins also.

### **Basic clinical pharmacology of dietary fibre: -**

It helps in slow down the digestive process thus gives a good control in blood glucose, improves insulin sensitivity, reduces risk of diabetes, maintains weight, helpful in obesity, reduces blood pressure, reduces cholesterol, reduces inflammation, reduces risk of heart disease, relieves constipation thus helpful in piles, fistula & other rectal disorders & disease, improves bowel movement thus improves bowel health, slowdowns the digestion thus improves quality of digestion, reduces risk of many types of cancer.

- **Copper: -**

It is an essential micronutrient mineral; its symbol is Cu & atomic no. 29; there are lot of health benefits of it; it is needed in little amount in the body.

### **Main sources of copper: -**

It is present in beetroot leaves, watermelon, spirulina (water-plant), nuts, seeds, lobster, leafy green vegetables, guava, grapes, green olive, kiwi, mango, pineapple, pomegranate, egg each.

### **Basic pharmacokinetics of copper (based on human intake in natural food products): -**

It is absorbed 30 to 50%; it is absorbed easily than other minerals, its absorption depends on the copper present in the body, when the intake of it is less, absorption is increased & when intake is more absorption is less, it is mainly absorbed in small intestines & little in stomach via carrier-mediated process; its absorption is influenced by amino acids, vitamin C & other dietary factors. After absorption it is bound primarily to albumin, peptide & amino acids & transported to liver. Copper is secreted into plasma as a complex with ceruloplasmin. It is mainly stored in liver little in brain, heart & kidneys; it is excreted mainly in bile & little in urine.

### **Basic clinical pharmacology of copper: -**

Together with iron it enables the body to form RBC; it helps to maintain health of bones, blood vessels, nerves & immune system; it also acts on iron absorption, protein metabolism, growth of body, it acts also on development of brain, heart & other organ; it is needed by the body for making ATP, collagen. Excessive of it may cause Wilson's disease.

### **Deficiency of copper: -**

It is very rare; but may cause cardiovascular disease, genetic defects, inflammation of optic nerve etc.

- **Choline: -**

It is water soluble vitamin & essential nutrient, it is a constituent of lecithin; it helps in many functions of the body.

### **Main sources of choline: -**



It is present in watermelon, egg, peanut, fish, dairy products, wheat, beetroot, spinach, beans, whole grains, pomegranate etc.

**Basic pharmacokinetics of choline (based on human intake in natural food products): -**

Choline is mostly present in food in free form; it is absorbed in small intestine via transporter proteins & metabolized in liver; excessive choline is not stored but converted into phospholipids; it is changed into Trimethylamine in liver & is excreted in urine.

**Basic clinical pharmacology of choline: -**

It helps the nerves to develop signals. Our body makes some amount of choline, but should be consumed to avoid deficiency; it helps liver function, brain development, muscles movement, cell messenger system, DNA synthesis, nervous system, gall bladder function; it can be taken in pregnancy because it prevents neural tube defect. It aids in fats & cholesterol metabolism & prevent excessive fat building in liver.

- **Selenium: -**

It is an essential trace mineral, it is micro nutrient helpful to our body; its symbol is Se & atomic no. 34.

**Main sources of selenium: -**

It is present in watermelon, fish, nuts, beef, chicken, mushroom, egg, grains, garlic etc.

**Basic pharmacokinetics of selenium (based on human intake in natural food products): -**

It is mainly absorbed in duodenum & proximal jejunum by active transport process; Dietary selenium is in 2 forms organic (selenomethionine) it is 90% absorbed & inorganic (selenite) it is 50% absorbed; after absorption it is send in liver via portal veins, liver turns it into selenite & then is bound with selenoproteins & send into blood stream, gets in RBC, muscles, tissues etc; it is not distributed evenly in the body, liver has more of it; Vitamin E & other vitamins increases its absorption & both work as an anti-oxidant. Natural selenium remains in the body for less than 24 hours; it is stored in amino acid in skeletal muscles, little in liver, kidneys & pancreas; it is primarily excreted in urine, stool & expired in air via lungs very little in sweat & semen.

**Basic clinical pharmacology of selenium: -**

It is important for many body functions, immune system, fertility (both male & female); it contributes in thyroid hormone metabolism, DNA synthesis; it protects the body from oxidative damages & infection, it is found in tissues, skeletal muscles; it helps testies & seminal vesicles in their function; it reduces the risk of miscarriages, liver disease, cancer, asthma, cardio vascular disease; deficiency of it causes pain in muscles & joints, weaken the hair, nails, white spots on nails are found etc

- **Glycosides: -**

Glycosides are organic compound present in plants & animal sources in which sugar group bounded to its carbon are bounded to another functional molecule. When it is hydrolyzed with enzymes give one or more sugar moiety & this is called as glycone. The word glycosides refer to any sugar or group of sugar (lactose, fructose, glucose etc) (please note glucose only is called as glucoside; please see the difference gly & glu).

**Main sources of glycosides: -**

It is present in many plants, fruit, vegetable & herbs & is called with different name as per present in which plant (example: - glycoside present in senna herb is called as sennosides).

**Basic pharmacokinetics of glycosides (based on human intake in natural food products): -**

Its absorption, metabolized & excretion are not yet known & are in research.

**Basic clinical pharmacology of glycosides: -**

It is anti oxidant, anti cancer, anti tumour, anti inflammatory, helpful to liver function, anti viral, anti bacterial, anti fungal, helpful in heart diseases, cardiac arrhythmia, heart failure, congestive heart failure etc.

- **Modern uses of pomegranate: -**

**For general health: -**

Take one medium size pomegranate, 1 date, 5 pieces of watermelon, 1 fig, 1 cup rain or zamzam water & 1 cup cow milk, 1 spoon pure honey prepare juice out of it & drink whole without filtering or staining, on empty stomach early morning once a week lifelong.

**For heart health: -**

Take one medium size pomegranate, 1 quince, 5 pieces of watermelon, 7 raisins, half cucumber, 1 spoon pure honey, 1 cup zamzam water, 1 spoon extra virgin olive oil & prepare juice out of it & drink without filtering it, on empty stomach early morning once or twice a week lifelong.

**For weak digestion: -**

Take 1 small pomegranate, 7 raisins, small piece of ginger, 7 seeds of fenu greek seeds (methi), 7 seeds of black seeds (kalonji) soak all for 1 hour in water & boil it on low flame & strain (filter) & drink the tea on empty stomach 1 cup each times before meal for 7 days followed by twice a day for 7 days followed by once a day for 7 days.

**For asthma & sinus: -**

Take 7 seeds of kalonji crush it in little olive oil & put in both nostril 3 times a day for 11 days than alternative 11 days followed by once or twice a week till complete relief.

Take 1 fig, 1 small pomegranate, 3 raisins, 7 seeds of fenu greek seeds (methi), add 1 cup zamzam water prepare juice out of it & drink without filtering it; daily empty stomach early morning for 21 days then alternative 21 days followed by once or twice a week lifelong.

**For blood pressure: -**

Take 1 small beetroot, 5 pieces of watermelon, 1 spoon of extra virgin olive oil, 1 cup zamzam or rain water, prepare juice out of it & drink it without filtering it, on empty stomach early morning daily once lifelong. Do not leave your blood pressure medicine without consulting your doctor.

**For detox the body: -**

Take 1 small orange, half lemon, 3 dates, little ginger, 1 small cucumber, 1 small beetroot, 1 spoon extra virgin olive oil, 1 spoon pure honey, 1 cup zamzam water, prepare juice out of these & drink the juice without filtering, every Sunday morning in breakfast & do not take anything in breakfast, drink lot of water till lunch & eat talbinah or barley broth in lunch every Sunday, by this your body will get free from harmful substance in your body.

**For weakness or pre workout: -**

Take 1 banana, 5 pieces of watermelon, 3 dates, 1 spoon pure honey, 1 beetroot, 1 cup water prepare juice and drink without filtering it, pre workout or in weakness once a day.

**For loose motions: -**

Take 1 pomegranate whole with its peel wash it properly & soak it whole (with its peel, arils etc) in 1 & half glass of water for 1 hour & boil it on low flame for 15 minutes & filter & add little sugar in it & drink it 3 times a day till complete relief from motions.

**For denque, malaria recovery: -**

Take 1 pomegranate, 3 dates, half banana, half beetroot, 5 pieces of watermelon, half quince, 1 spoon pure honey prepare juice out of it, do not filter & drink once or twice a day till complete recovery.

## Pomegranate - Nutritional Facts per 100 g

### Nutrition Mg Percentage

Folates	38 µg	9.5%
Niacin	0.293 mg	2%
Pantothenic acid	0.135 mg	3%
Pyridoxine	0.075 mg	6%
Riboflavin	0.053 mg	4%
Thiamin	0.067 mg	5.5%
Vitamin C	10.2 mg	17%
Vitamin E	0.60 mg	4%
Vitamin K	16.4 µg	14%
Sodium	3 mg	0%
Potassium	236 mg	5%
Calcium	10 mg	1%
Copper	18%	0.158 mg
Iron	0.30 mg	4%
Magnesium	12 mg	3%
Manganese	0.119 mg	5%
Phosphorus	36 mg	5%
Selenium	0.5 µg	1%
Zinc	0.35 mg	3%





