

10. Grapes & Raisins.



Grapes are famous edible fruit eaten throughout the world; it is harvested throughout the world; it has lot of health benefits; it can be eaten in fresh form or dried form (raisin). There are 60 varieties of it having different taste, shape & colour. In Latin it is called as *Vitis vinifera* (a common variety of grape), different varieties have little different names in latin; its botanical family is Vitaceae; it is called as A'naab (plural) & I'nab in Quran & Arabic, In Hadith dried grapes (raisins) are called as Zabib. Please read lesson no. 30 in my book part-2, page no. 20 onwards. Zabib is mentioned in Hadith of Abu-Nuaim, An-Nasai, Ibn-Majah, Muslim. In Hadith it is mentioned that it is a health meal, removes tiredness, cools the anger, strengthens us, reduces phlegm, brightens the face, improves complexion, improves mood, increases good smell in breath, removes sorrow, removes inferior complex. Zabib were soaked in water overnight & the syrup was drunk since that time & its syrup is called as Nabiz, it is beneficial for health; its wine is prohibited in Islam.

- **Quranic reference of it: -**

In Quran grapes are mentioned at 11 different verses, it is called as I'nab in 2 places at chapter 17 Bani Israel verse no. 91 & Chapter 80 Abbas verse no. 28. It is called as A'naab at 9 places: -

1. Chapter no. 2 Baqarah verse no. 266.
2. Chapter no. 6 An'aam verse no. 99.
3. Chapter no. 13 Raad verse no. 4.
4. Chapter no. 16 Nahl verse no. 11.
5. Chapter no. 17 Bani Israel verse no. 91.
6. Chapter no. 18 Kahf verse no. 32.
7. Chapter no. 23 Muminoon verse no. 19.
8. Chapter no. 36 Yaseen verse no. 34.
9. Chapter no. 78 Nabaa verse no. 32.

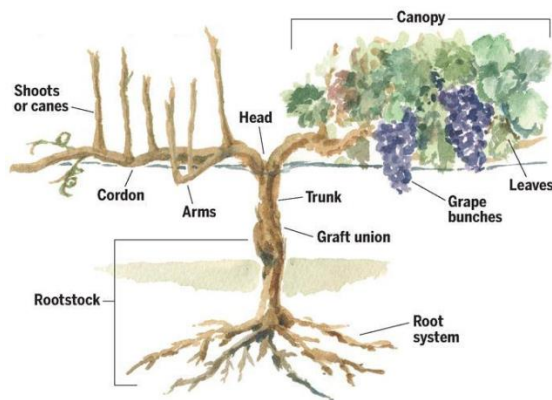
- **NAMES:**

1. It is called A'nab (plural) & I'nab (singular) & in Arabic and Quran.
2. In Hadees dried Grapes (Raisins) are called as Zabib (الزبيب).
3. In Hindi, Urdu, Persian it is called as Angoor & dried one is called as Munakka, Kishmish.
4. In Sanskrit it is called as Draksha.
5. In Latin it is called as *Vitis vinifera* Linn.
6. Family is Vitaceae.
7. In English dried grapes are called as Raisins.

Please visit my website www.tib-e.nabi-for-you.com for detail Islamic study on Grapes & raisins.

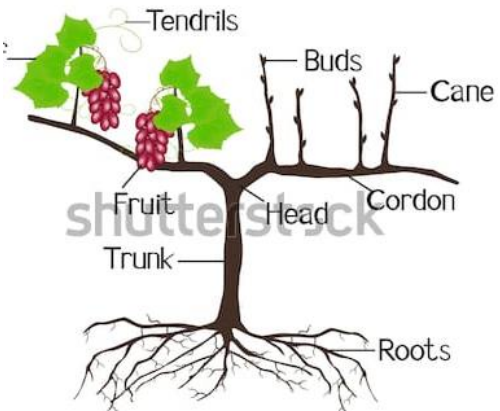
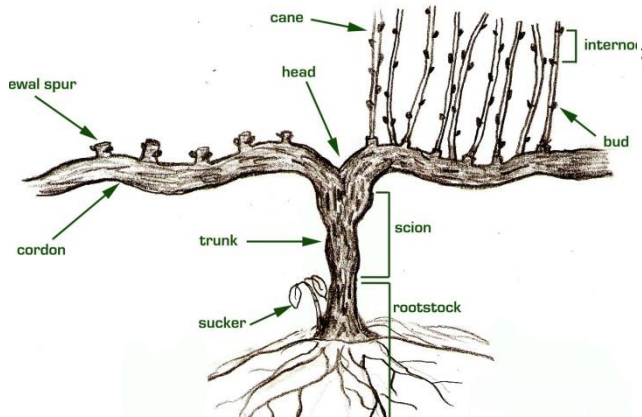
It is mentioned in following books of Hadith (reference are also given as Hadith number) An-Nasai; Ibn Majah, Muslim, 1991 A, Abu Nuaim.

- **Grapes tree/plant/vine: -**



There are 60 varieties of it; it is a flowering plant, famous for its edible fruit-grapes; it is perennial & deciduous plant; it is a long, climber, stemmed, woody vine. The vine can reach (grow) till 30 meters high & grows wide & can live for many years. Like other plants has trunk with rooting system, on old shoots there are leaves, tendrils, flowers, buds & grapes.

- **Rooting system, trunk & buds: -**

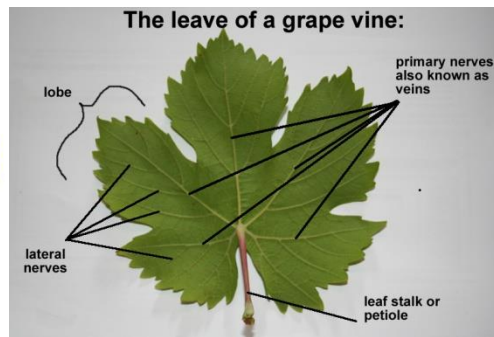


The roots of grape-vine are multiple branched go depths into soil. Its trunk is the main stem; it is permanent & supports leaves, branches, stem etc. Its buds develop in the leaf axil, between the shoot & leaf petiole. Buds are of 3 distinct growing known as primary, secondary & tertiary buds. The buds grow into shoots (stem).

- **Shoots: -**

Shoots are green stem which develop from buds, the shoots that arise from primary buds are normally the fruit producing shoots. The shoots consist of stems, leaves, tendrils, fruits (canopy).

- **Leaves: -**



The shape & size are different in different varieties of it, the colour of leaves is light to dark green and are of medium to large heart shaped with multiple lobes, alternative pattern, serrated (tooth edges), pointed tips on each lobe, leaves are tender, have light citrusy, green, edible (cooked or eaten raw), tangy taste.

- **Tendrils: -**



They are slender structure appear on the top & sides of the stem. It grows until the plant is ready for harvesting, after the harvest they became woody in nature. The plant is a climber & it needs tendrils to coil around the small objects.

- **Flowers: -**



Flower cluster grow on the opposite site then leaves along the shoot. Each cluster has several hundred flowers & develops in clusters of grape fruit. The flowers do not have petals, are fused to calyptres (a green structure called as cap). Every flower consists of a single pistil (stigma, style, ovary-female organs) & 5 stamens (anther & filament-male organ). The flowers are mostly hermaphroditic (having both male & female reproductive organs) & they are mostly self-pollinating & produce fruit.

- **Fruit –grapes: -**

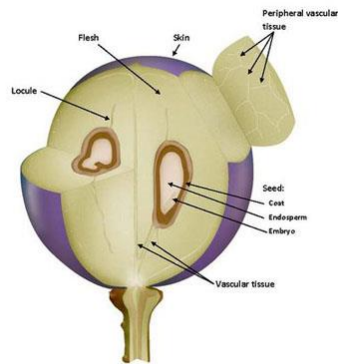


Figure 1: Structure of a ripe grape berry partially sectioned on the long and central axis to show internal parts.
Illustration by Jordan Koutoumanidis, WineTales.



It is called as queen of fruits. The fertilized flower began to develop a seed & grape berry to protect the seed. Not all flowers get fertilized, the unfertilized flower fall off. Grapes are of many varieties each variety has different colour, taste, shape & size. Grapes are eaten fresh raw or dried and eaten (raisins). It is used in pickles, wines, vinegars, cooking, sweets meats & etc. Some varieties are seedless & some have seeds.

- **Grapes seeds: -**



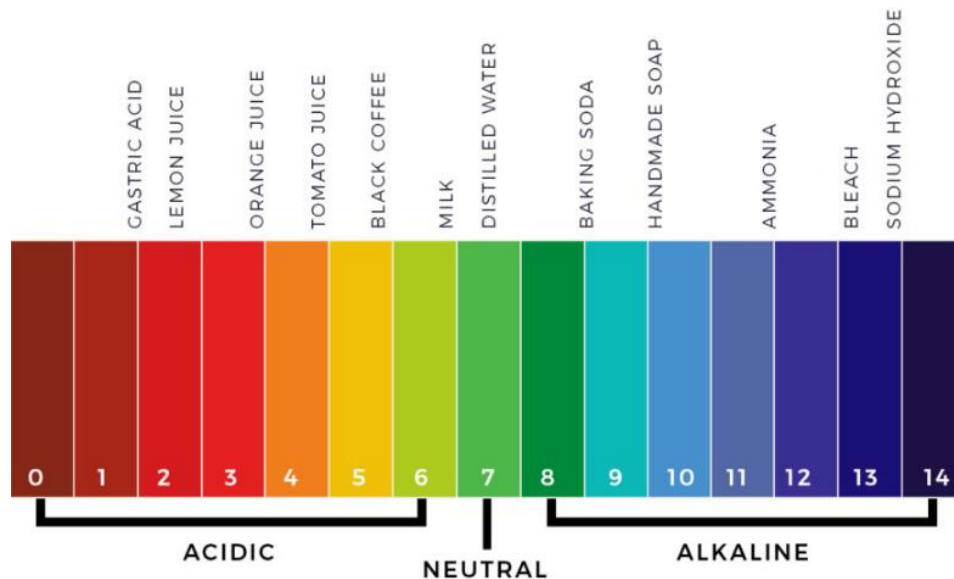
Grapes seed extract is a derivative of whole grape seed; the extract contains proanthocyanidin & procyanidin. It has lot of health benefits like controls blood pressure, improve blood flow, reduces oxidative stress, improves collagen formation thus promotes bone & joint health & wound healing. Below more benefits are mentioned please read in their sections.

- **pH of grapes & raisins is:** -pH of grapes is 3.5 to 4.5 & raisins pH is above 4; both are acidic because its pH is below 7.

pH is a measure of hydrogen ion concentration, a measure of the acidity or alkalinity of a solution. The pH scale usually ranges from 0 to 14. Aqueous solutions at 25°C with a pH less than 7 are acidic, while those with a pH greater than 7 are basic or alkaline & 7 is neutral; only aqueous solutions have pH levels, vegetable oil has no pH value. Likewise, other oils such as animal and petrochemical oils also have no pH value. Fatty acids are organic molecules often found in foods, including vegetable oils.

The pH of pure water is 7. In general, water with a pH lower than 7 is considered acidic, and with a pH greater than 7 is considered alkaline. The normal range for pH in surface water systems is 6.5 to 8.5, and the pH range for groundwater systems is between 6 and 8.5. We can add normal water to reduce the acidity.

It is Sunnat of Prophet Muhammad (s.a.w) to mix acidic with Alkaline to make it neutral or less acidic that why He use eat dates with watermelon or cucumber or dry dates with little butter; so you can mix one acidic with alkaline; also it is Sunnat to drink honey mixed in water; also dates or raisins soaked in water over night & drink the syrup (sharbat). Remember do not soak dates & raisin together at one time; soak at separate time & drink.



- **Calories of grapes: -**

100 grams fresh grapes give 67 calories & dried give 249 calories, seeds give 880 calories.

- **Glycemic index & Glycemic load of it: -**

60 grams of raisins gives glycemic index 64 & glycemic load 28;

220 grams of fresh grapes gives 49 glycemic index & glycemic load 9.

A food is considered to have a low Glycemic index (GI) if it is 55 or less; mid-range GI if 56 to 69 & high GI if 70 or more. Glycemic index is a number. It gives you an idea about how fast your body converts the carbs in a food into glucose.

A low Glycemic load (GL) is between 1 and 10; a moderate GL is 11 to 19; and a high GL is 20 or higher. For those with diabetes, you want your diet to have GL values as low as possible.

The glycemic load (GL) of food is a number that estimates how much the food will raise a person's blood glucose level after eating it. Glycemic load accounts for how much carbohydrate is in the food and how much each gram of carbohydrate in the food raises blood glucose levels.

- **Gross health benefits of grapes: -**

It is anti oxidant, anti cancer, promotes heart health, controls blood sugar, blood pressure, relief constipation, reduces fatigue, depression, prevents kidney disorders, macular degeneration, cataract, free radicals, strengthens the bones, joints, teeth, relief migraine, improves digestion, reduces risk of alzheimer's, boost immune system, controls cholesterol, it is a natural anti bacterial.

- **Gross health benefits of raisins: -**

It reliefs constipation, increases RBC & HB formation thus helpful in anaemia, promotes bone, teeth health, it is anti oxidant, anti bacterial, good in recovery from malaria, dengue, typhoid & other illness, improves memory, digestion, sleeps, kidney health, weight gain, reduces phlegm.

- **Gross health benefits of grape seed oil: -**

It is anti arthritis, anti inflammatory, anti diabetes, anti oxidant, promotes hair, skin, nails health, reduces cholesterol, blood pressure, eczema, dementia, alzheimer's, psoriasis, rosacea, allergic reactions, hair loss, promotes wound healing, libido, prevent aging, cardio vascular diseases etc.

- **Gross health benefits of grape seed extract: -**

It is derived from grape seeds, it improves circulation of blood, reduces cholesterol, blood sugar, blood pressure, reduces swelling, promotes eye health, wound healing due to collagen formation, it is anti oxidant. The extract contains proanthocyanidin; its quality is measured by procyanidin which is formed

by proanthocyanidin. It contains 95% of procyanidin. It is anticancer, controls blood pressure, improves blood circulation, reduces oxidative stress & damage, improves kidney & brain function, promotes bone health, reduces infections, swelling, helpful in eye diseases related to diabetes.

- **Gross health benefits of raisin-water: -**

It is called as Nabiz in Arabic & Hadith, it is Sunnah to drink its water, some raisins should be soaked in little water for few hours & drink this water discard the soaked raisins. It improves liver function, digestion, purifies blood, increases hemoglobin formation, makes bones stronger, and relieves constipation etc.

- **Clinical pharmacology of grapes & raisins: -**

Grapes & raisins contain powerful antioxidants known as polyphenols. These are thought to have anti-inflammatory and antioxidant properties. One of these is resveratrol. It is found in the skins of red grapes. Laboratory studies have suggested that resveratrol may be able to slow or prevent the growth of tumors in lymph, liver, stomach, breast, colon, skin cancer, and leukemia. Resveratrol is also present in red wine. Few studies have looked at the association between red wine and cancer risk in humans, but it has been shown that high intakes of alcohol on a consistent basis can increase the risk of cancer.

Quercetin and resveratrol may reduce the risk of atherosclerosis and protect against the damage caused by low-density lipoprotein (LDL), or “bad” cholesterol.

Polyphenols in grapes & raisins such as resveratrol are thought to have antioxidant, lipid-lowering, and anti-inflammatory actions that may help reduce the risk of cardiovascular disease (CVD). They may achieve this by preventing platelet build-up and reducing blood pressure and the risk of irregular heart rhythms.

Grapes contain fiber and potassium, both of which support heart health, potassium intake while improves blood pressure and cardiovascular health.

Grapes & raisins contain water and fiber. These can help people stay hydrated, keep bowel movements regular, and reduce the risk of constipation.

Anti-inflammatory effects of quercetin, some suggest that consuming grapes may help to alleviate symptoms of allergies, including runny nose, watery eyes, and hives.

Grapes & raisins contain the antioxidants lutein and zeaxanthin, which can help maintain eye health. They are thought to neutralize unstable molecules known as free radicals. In this way, they may reduce oxidative stress and damage to the retina, and help prevent cataracts and other conditions.

Resveratrol could help treat acne. There are lots of more benefits which you can read below in separately mentioned contents.

- **Modern uses of it: -**

For general health & detox: -

Take 21 raisins & soak in 1 glass of water overnight & filter in morning and drink the syrup early morning empty stomach discard the soaked raisins, drink twice or thrice a week regularly.

For weak bones & joint:-

Take 21 raisins & soak in 1 glass of milk overnight & keep in fridge & boil it little early morning & drink it on empty stomach or with breakfast, three times a week for 21 weeks followed by once a week regularly.

For recovery from diseases like typhoid, malaria, dengue etc: -

Take 7 raisins, a small banana, 3 dates, 5 pieces of watermelon eat in breakfast & evening 6.00pm for 7 to 11 days.

For weak memory: -

Eat 21 raisins, 5 piece of watermelon, 3 dates & a small cucumber early morning daily for 21 days followed by thrice a week for 7 weeks followed by once a week regularly.

- **Contents of grapes: -**

All contents may not present in all types of it, because there are many varieties of it according to geographical regions & content may differ a lot as per cultivation, soil, seed, climate etc.

Water 85%, little sodium, potassium, dietary fibers, sugar (fructose mostly), little protein, vitamin A, C, D, B6, B12, E, B1, B2, B3, B5, folate, zinc, magnesium, iron, calcium, carbohydrate, copper, manganese, carotene, alpha & beta leutin & zeaxanthin, phosphorus choline, betaine, selenium, fluoride, phytosterol, resveratrol, flavonoids (myricetin, quercetin, lycopene, ellagic acid), apigenin, naringenin, Diosmetin, Catechin (in grape seed), caftaric acid, protocatechuic acid, syringic acid, limonene, copaene, Valencene, Coumaric acid.

- **Contents of raisins: -**

All above & sulfites, omega 3 & 6, boron.

- **Content/constituents of grape seed oil: -**

Palmitic acid, stearic acid, monounsaturated fatty acids, polyunsaturated fatty acids, palmitoleic acid, oleic acid, quercetin, phenols (tocopherols, campesterol, beta-sitosterol, phytosterol, stigmasterol, procyanidin, proanthocyanidin) flavonoids, carotenoids, tannin, stilbenes, linolenic acid, vitamin C, Copaene

A good quality grapes & raisins contain little amount of amino acids mentioned below in the table: -

The above ingredients are based on scientific study, means these has been identified, known & learnt by modern science, it does not mean that it contains only these ingredients; there may be many more ingredients which are yet to be discovered, learnt & known by modern science.

Active ingredient of grape: is Punicalagin & ellagic acid, Flavonoids (4-5%) (Rutin, quercetin, kaempferol) Gallic, tannins and Catechins), polyphenol, anthocyanins, resveratrol.

seed	gallic acid, (+)-catechin, epicatechin, dimeric procyanidin, proanthocyanidins
skin	Proanthocyanidins, ellagic acid, myricetin, quercetin, kaempferol, trans-resveratrol
leaf	myricetin, ellagic acid, kaempferol, quercetin, gallic acid
stem	rutin, quercetin 3-O-glucuronide, trans-resveratrol, astilbin
raisin	hydroxycinnamic acid, hydroxymethylfurfural

Amino acids	Fresh grapes red or green	Raisins (dried grapes)
Weight (g)	151 grams	165 grams
Tryptophan(mg) (% RDI)	17 (6%)	83 (29%)
Threonine(mg) (% RDI)	33 (3%)	127 (12%)
Isoleucine(mg) (% RDI)	17 (1%)	94 (7%)
Leucine(mg) (% RDI)	33 (1%)	158 (6%)
Lysine(mg) (% RDI)	41 (2%)	139 (7%)
Methionine(mg) (% RDI)	14 (2%)	35 (5%)
Cystine(mg) (% RDI)	15 (5%)	31 (11%)
Phenylalanine(mg) (% RDI)	29 (3%)	107 (12%)
Tyrosine(mg) (% RDI)	15 (2%)	20 (2%)

Valine(mg) (% RDI)	33 (2%)	137 (8%)
Histidine(mg) (% RDI)	33 (5%)	119 (17%)
Arginine(mg)	196	681
Alanine(mg)	33	173
Aspartic acid(mg)	57	182
Betaine(mg)	0	0
Glutamic acid(mg)	122	271
Glycine(mg)	24	132
Proline(mg)	121	419
Serine(mg)	33	116

- **Basic pharmacology of contents of grapes, seed & raisins, that are naturally present & not synthetic: -**
- **Resveratrol: -**

It is a stilbenoid, a type of natural phenol & phytoalexin, produced by several plants in response to injury or infection of the plant.

Main sources of resveratrol: -

Grape skin, grape juice, blue berries, raspberries, mulberries, peanut etc.

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

Its absorption, metabolism & excretion are yet not known & are under research. It is absorbed through saliva & intestines. It is very little aqueous soluble. It is highly absorbed but bioavailability is about 0.5% due to extensive hepatic glucuronidation & sulfation. It gets metabolized in liver & lungs mainly & also in other parts of the body, it is excreted in urine, bile & excreted as metabolites mainly.

Basic clinical pharmacology of resveratrol: -

It is anti oxidant, anti cancer, anti inflammatory, anti aging, anti infective, prevents heart disease, alzheimer's, diabetes, improves testosterone level, helpful in drug induced kidney damage, best for labialis (cold sores on lips), herpes simplex types 1 & 2.

- **Phytosterol: -**

It is plant sterol & stanol esters; it is a group of naturally occurring compound found in plant cell membranes. It is structurally similar to our body's cholesterol & it competes with cholesterol during digestion & blocks absorption of it thus reduces blood cholesterol & is good for heart.

Main sources of phytosterol: -

Vegetable oil, seeds, nuts, grapes, cereals, nuts, legumes etc.

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

It is absorbed only in trace amount only; it inhibits the absorption of intestinal cholesterol & biliary cholesterol.

Basic clinical pharmacology of phytosterol: -

It reduces cholesterol, risk of coronary heart disease, cancer cells growth, prevent diseases, maintain prostate gland health, it is anti inflammatory, maintain health of nails, hair etc.

- **Campesterol: -**

It is a phytosterol whose chemical structure is similar to cholesterol, it is phyto-steroid in nature; it reduces cholesterol (reduces absorption of cholesterol in intestine), prevents cancer.

Main sources of campesterol: -

Soybean oil, vegetable oil, banana, cucumber, grapes seed oil, onion, potato, lemon grass etc.

- **Stigmasterol: -**

It is among unsaturated phytosterol; it maintains the structure & physiology of cell membrane; it reduces LDL & cholesterol, reduces risk of heart diseases, it prevents atherosclerosis.

Main sources of stigmasterol: -

Soybean, calabar bean, rape seed, legumes, nuts, milk, seeds, grape seed oil etc.

- **Quercetin: -**

It is a plant flavonol from the flavonoid group of polyphenols; it is bitter in taste.

Main sources of quercetin: -

Red onion, green tea, apples, ginko biloba, grapes etc.

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

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

Basic clinical pharmacology of quercetin: -

It is good for heart diseases, coronary heart disease, prevents cancer, arthritis, bladder infection, diabetes; it is anti oxidant, anti inflammatory, reduces benign prostatic hyperplasia, cholesterol, blood pressure, asthma, symptoms of rheumatoid-arthritis.

- **Apigenin: -**

It is a natural flavonoid compound found in many fruits & vegetables serves multiple physiological functions.

Main sources of apigenin: -

It is present in onion, oranges, wheat, tea, grapes, parsley, thyme.

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

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

Basic clinical pharmacology of apigenin: -

It calms the nerves, provides antioxidant effects, prevents & helps the body to fight cancer; it is anti-obesity; neuro-protective, help mood & brain function; reduces cortisol, blood sugar; improves bone, heart & skin health; promotes sleep. It is also anti bacterial, anti viral; reduces blood pressure.

- **Naringenin: -**

It is bitter, colourless flavanone (a type of flavonoid); it is trihydroxy-flavanone; it is lipophilic, it is mainly present in grapes & other fruits & herbs.

Main sources of naringenin: -

It is present in grapes, tomato, cocoa, sour oranges, Greek oregano, beans, thyme, cherries, marjoram, bergamot etc.

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

It is lipophilic (tending to combine with or dissolve in lipids or fats), thus readily absorbed intestinal epithelium by passive diffusion into enterocytes; it reaches the blood circulation by multidrug resistance-associated protein (MRP1) or can be transported by active transport efflux protein carrier P-glycoprotein (P-gP) & with Mrp2 back to the intestine lumen out of the enterocytes, repeating the cycle; liver metabolism is via phase II conjugation by UDP-glucuronosyl transferase (UGT), sulotransferase & catechol-o-methyl-transferase.

Basic clinical pharmacology of naringenin: -

It is anti inflammatory, antioxidant, it helps in controlling blood pressure, blood sugar, obesity, metabolic syndromes; it is anti cancer, helpful in curing liver diseases; it is antiulcer, reduces gastric secretion by acting on H2 receptor thus it is antacid, estrogen antagonist, anti inflammatory, antioxidant.

- **Catechin:-**

It is a natural polyphenol; it is a plant secondary metabolite.

Main sources of catechin: -

It is mainly present in tea, cocoa, berries, apples, grapes seeds, kiwi, strawberries, green tea etc.

Basic clinical pharmacology of catechin: -

It is antioxidant, prevents cell damage, anti-inflammatory, anti-cancer, promotes heart & brain health and reduces blood pressure & weight.

Rutin: -

It is also called as Rutoside, it is a citrus flavonoid found in many plants including citrus fruits & it is soluble in water & alcohol.

Main sources of rutin: -

It is present in green tea, quince, apple, asparagus, black tea, citrus fruits, grapes, cherries, apricot, noni, leaves of eucalyptus, buck wheat, ginkgo biloba, raisins etc.

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

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

Basic clinical pharmacology of rutin: -

It reduces high blood pressure, bleeding, bleeding piles, it strengthens the blood vessels, it reduces risk of cancers due to its anti oxidant & anti free radicals activity, reduces bruise, inflammation, protects heart, brain etc; it is chelator of metal ions.

Kaempferol: -

It is a natural flavonol (a type of flavonoid) it is tetra-hydroxy-flavone.

Main sources of kaempferol: -

Fenugreek seeds, green tea, grapes, tomato, broccoli, spinach, raspberries, peaches, green beans, onion, potato etc.

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

It is ingested as a glycoside, absorbed in small intestines usually by passive diffusion; it is metabolized in various parts of the body. In small intestine it is metabolized to glucuronide & sulfo-conjugate by intestinal enzymes & it is also metabolized by colon micro-flora (bacteria) which can hydrolyze the glycosides to aglycones or form simple phenolic compounds. It is mainly metabolized in liver to glucurono-conjugated & sulfo-conjugated form. It is mainly excreted in urine.

Basic clinical pharmacology of kaempferol: -

It is anti oxidant, anti inflammatory, anti microbial, anti cancer, cardio protective, neuro microbial, anti diabetes, estrogenic, analgesic, anxiolytic, anti allergic, anti viral etc.

- **Flavonols: -**

Flavonols are polyphenols & belong to class of flavonoids; they are colourless molecules that accumulate mainly in the outer & aerial tissues (skin & leaves) of the fruits & vegetables because their biosynthesis is stimulated by light so absent in inner parts of fruits & vegetables. There are more than 7000 flavonoids discovered yet & many more are to be discovered.

Main sources of flavonols: -

It is present in tea, leek, onion, broccoli, kale, berries, grapes, quince, cucumber etc.

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

Its absorption, metabolism & excretion in natural form are not yet known & are under research. Flavonoids are mostly absorbed in small intestine, after absorption flavonoids conjugates with glucuronic acid or sulfate or methylation may occur; no free flavonoids are found in plasma or urine except catechin; the part of it which remains undigested is degraded into phenols in colon (large intestines) by microorganisms & absorbed, the absorbed part is further metabolized in liver; it is excreted via urine & bile.

Basic clinical pharmacology of flavonols: -

All types of flavonols are anti oxidant, anti inflammatory, anti cancer, reduce oxidative stress, maintains heart health, helpful in asthma, stroke, helps in regulating cellular signaling etc.

- **Diosmetin: -**

It is a naturally occurring flavone; it is also called atrihydroxy-4methoxy-flavone; it is present in Caucasian vetch, marjoram, citrus fruits, lemon peel, orange, grapes; it is a mono-methoxy-flavone; it is antioxidant, anti-cancer, anti-microbial, estrogenic, anti-inflammatory.

- **Myricetin: -**

It is among polyphenolic flavonoid. It is anticancer, anti oxidant, anti bacterial, anti inflammatory; reduces weight, cholesterol, L.D.L & triglycerides.

Main sources of myricetin: -

Nuts, berries, grapes, tea, walnut, onion, herbs etc.

- **Syringic acid: -**

It is a naturally occurring Trihydroxybenzoic acid or dimethoxybenzoic acid; it has a role as a plant metabolite, it is a member of benzoic acid & phenols; it can be derive from gallic acid; it is anti-diabetic, it is present in wheat, maize, oats, rice, dates, apple, grapes, olive oil, rape, seed oil ,thyme, marjoram, vinegar, walnut etc.

- **Limonene: -**

It is a cyclic monoterpene & is the major component in the oil of citrus fruit peels; it is soluble in water; it has a pleasant aroma.

Main sources of limonene: -

It is present in orange, orange peel, grapes, lemon, lime, mandarins & marjoram.

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

Limonene is completely absorbed when taken orally; it can be absorbed by inhalation up to 70%; it can be also absorbed by skin; it is distributed throughout the body & fats tissues; it is metabolized in liver & excreted in urine.

Basic clinical pharmacology of limonene: -

it is anti-inflammatory, antioxidant, anti-stress, prevents diseases, it is a natural insect repellent, it is used as an additive & flavouring agent, it is used in shampoo, soaps, perfumes detergent making, also used in laundry, cosmetics, air fresher etc. It is also available in concentrated supplement in capsules & liquid form; it is anti-inflammatory, antioxidant, anti-cancer, heals heart disease, strengthens the heart, reduces stress, anxiety and improves digestion.

- **Boron: -**

It is natural minerals present in beetroot; it has lot of health benefits. Its symbol is B & atomic no. is 5; it is a trace mineral important for bone health.

Main sources of boron: -

It is present in beetroot, apple seed, raisin, almond, peanut, dried apricot, raisins etc.

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

It is absorbed in intestine mainly & completely, it is little absorbed through skin & inhalation, it is believed that it is absorbed via passive transport in the form of borate (research is on); it is excreted mainly in urine, 2% in stool, little in sweat & breath.

Basic clinical pharmacology of boron: -

It is best for nerve function & nerve booster, good for brain, it is health enhancer, improves calcium metabolism, helps to handle other minerals, cardio vascular health, reduces allergy, reduces auto immune reaction, make bones, teeth & gums strong, cure arthritis, lupus erythematosus, increases sex hormones, estrogen, testosterone; it is antioxidant, aphrodisiac & detox etc.

Deficiency of it may cause alter in brain activity thus hamper neuronal function, alter brain wave activity enhancing delta power in the left parietal & temporal lobes & decreased frontal lobe activity.

- **Sulfites: -**

It is a natural compound found in vegetables, fruits etc & also in human body. It is a natural preservative; many people are allergic to it; it is anti oxidant, reduces abdominal pain, diarrhea, controls blood pressure.

Main sources of sulfites: -

Peanut, raisins, black tea, vinegar, broccoli, cabbage, onion, garlic, kale, cauliflower etc.

- **Fluoride: -**

It is a naturally occurring mineral found in all sources of water & helps preventing cavities in teeth, makes enamel strong, prevents tooth decay, prevent teeth from acid attack. Makes immune system stronger, Excessive of it is injurious to health.

Main sources of natural fluoride: -

Tea, grapes, potato, coffee, shellfish, shrimps, water, rain water etc.

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

Much is not known about its absorption & metabolism. It is absorbed in stomach & small intestines, as it gets absorbed it rapidly enters mineralized tissues like teeth & bones; it does not get accumulated in soft tissues. Calcium & magnesium reduce its absorption.

- **Stillbenes: -**

It is also known as trans-stillbene; it is an organic compound, non-flavonoid phytochemical among polyphenolic structure; it is anti cancer, anti inflammatory, anti oxidant, prevent diseases, aging, obesity.

Main sources of stillbenes: -

Blue berries, grape seed oil, peanuts, soy etc.

- **Procyanidin & proanthocyanidin: -**

It is a member of proanthocyanidin (condensed tannin) class of flavonoids; it is compound, including catechins, epicatechin, gallocatechin & epigallocatechin. It reduces cholesterol, cardiac diseases, risk of stroke, prevents cancer, inflammation, tumours etc; it is also anti proliferative.

Main sources of both: -

Beans, black grapes, grape seeds, apples, chocolates, strawberries, blue berries, cranberries, ginkgo biloba, red cabbage etc.

- **Copaene: -**

It is an oily liquid hydrocarbon found in many essential oils (mainly copaiba tree, copaifera, langsdorfil); it is found in 2 forms alpha & beta; it is tricyclic sesquiterpenes; it is also found in oil of rhizome, piper, boahmeriaefolium, leaves & resin of canarjumparvumleen, croton, julocroton, marjoram, angelica root & seed oil, carrot seed & leaf oil, basil oil, bay leaf oil, cananga leaf oil, cajuput oil, clary sage oil, sweet orange oil, grape fruit oil etc; It is also called as aglaiene; it is colourless, clear, viscous liquid; it has woody spicy honey aroma; it is antimicrobial on gram positive & gram negative bacteria both; anti proliferative, antioxidant, anti-genotoxic, cytotoxic etc.

- **Omega 3: -**

It is also called as n-3 fatty acid, it is polyunsaturated fatty acid, it plays important role in human diet & physiology. It is of 3 type alpha linolenic acid, eicosapentaenoic acid (EPA) & docosahexaenoic acid (DHA).

Main sources of omega 3: -

Walnut, flax seed oil, clary seeds, algal oil, almond, hemp oil, fish, egg, fish oil, grape seed oil etc.

Basic pharmacokinetics of omega 3 (based on human intake in natural food products): -

Same as omega 6.

Basic clinical pharmacology of omega 3: -

It reduces risk of cardio vascular disease, cancer, heart disease, inflammation, symptoms of rheumatoid arthritis, promotes brain, nail, hair, skin, bone, joints health, reliefs depression, improves vision, strengthens the body.

• **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(based on human intake in natural food products): -

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.

• **Linolenic acid (ALA): -**

It is an omega 3 fatty acid, it essential fatty acid necessary for health & cannot be produced in human body, it is also called as ALA (alpha linolenic acid). It is the substrate for the synthesis of longer-chain, more unsaturated fatty acids eicosapentaenoic acid (EPA) & docosahexaenoic acid (DHA) required for tissue function.

Main sources of linolenic acid (ALA): -

Flax seed oil, rape seed oil, soybean, pea leaves, fish oil, evening primrose oil, vegetable oil, walnut, meat, grape seed oil.

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

Same as omega 6

Basic clinical pharmacology of ALA: -

It is useful to prevent heart disease, control blood pressure, control cholesterol, prevents & reverse atherosclerosis, it is anti inflammatory, anti obesity, anti cancer, reduces fibroadenoma, breast lumps, good & helpful for skin, nail, hair, brain, organs.

• **Lutein & zeaxanthin: -**

Both are important carotenoids found in nature, they are related with beta carotene & vitamin A, they give plants, fruits & vegetables yellow or red colour, they are absorbed best in human when taken with high-fat meal because it needs bile for digestion. Both are colour pigment found in human eye (macula & retina) they get deposited in macula & retina thus prevents many diseases of eyes.

Main sources of both: -

They are present in carrot, broccoli, kale, spinach, grapes, pumpkin, yellow vegetable, egg yolk, green leafy vegetable, orange, kiwi, corn etc.

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

They are absorbed with the help of bile by mucosa of small intestine via passive diffusion & send to the liver via lymphatic system & in liver it is incorporated into low density & high density lipo proteins & transported to target tissues (retina etc) by specific lutein binding protein mediates the selective uptake of it. The absorption depends on the amount & sources of intake; it is 70 % absorbed; it is excreted in bile & urine & stored in liver & adipose tissues of the body.

Basic clinical pharmacology of both: -

They are powerful anti oxidant, anti diabetic, anti cancer. They prevent age-related macular degeneration, cataract, retinitis pigmentosa, retinopathy, macular degeneration, they work as light filter & protect the eye tissues from sunlight damages, they block blue light from reaching the underlying structure in the retina of eyes thus reduces the risk of light induce oxidative damage that could lead to age-related macular degeneration (AMD).

They also prevent free radicals thus prevents colon cancer, cervical cancer, lungs cancer, breast cancer, prostate cancer, vision loss, improves mental function, respirative infections, reduce high blood pressure, reduce soreness of muscles after exercise, reduce eye strain, controls diabetes, prevent heart diseases etc.

- **Oleic acid: -**

Its short hand notation is C18:1, it is a non-essential (means it is produced naturally in the body) monounsaturated omega 9 fatty acids, 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 pumpkin 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, pumpkin seed oil, grape 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. So I advised to mixed powder of prednisolone mixed in extra virgin olive oil and apply on eczema & psoriasis and get good results in cheaper rates.

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.

- **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, pumpkin seed oil, grape 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, pumpkin seed oil, grape 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.

- **Catechic acid: -**

It is a non-flavonoid phenolic compound; it is an ester formed from caffeic acid & tartaric acid. It has hyaluronidase inhibitory activity; it is present grapes, thyme, vinegar, cone flower, marjoram, purple cone flower; it is antioxidant, enhances insulin secretion.

- **Protocatechuic acid: -**

It is a dihydroxybenzoic acid (a type of phenolic acid); it is structurally similar to gallic acid, caffeic acid, vanillic acid & syringic acid; it well known antioxidant, anti-inflammatory, anti bacterial, anticancer, anti ulcer, anti-ageing, antiviral, analgesic, protects liver, heart, brain & nerves; it is mainly present in green tea, bran & grains, almond, olive oil, star anise, plums, rosemary, Japanese ginkgo biloba.

- **Palmitoleic acid: -**

It is an omega 6 monounsaturated fatty acid; it is present in all tissues of human body & also in adipose tissues & in liver in high concentration.

Main sources of palmitoleic acid: -

It is mainly present in pumpkin seed oil, breast milk, vegetable oil, marine oil, macadamia oil, salmon oil, grape seed oil.

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

Its absorption, metabolism & excretion are under research.

Basic clinical pharmacology of palmitoleic acid: -

It is anti thrombotic thus helpful in stroke, it is anti inflammatory, reduces cholesterol & other lipids, high blood glucose, prevents cardio vascular disease, obesity and improves insulin sensitivity.

- **Copaene: -**

It is an oily liquid hydrocarbon found in many essential oils (mainly copaiba tree, copaifera, langsdorfil); it is found in 2 forms alpha & beta; it is tricyclic sesquiterpenes; it is also found in oil of rhizome, piper, boahmeriaefolium, leaves & resin of canarjumparvumleen, croton, julocroton, marjoram, angelica root

& seed oil, carrot seed & leaf oil, basil oil, bay leaf oil, cananga leaf oil, cajuput oil, clary sage oil, sweet orange oil, grape fruit oil etc; It is also called as aglaiene; it is colourless, clear, viscous liquid; it has woody spicy honey aroma; it is antimicrobial on gram positive & gram negative bacteria both; anti proliferative, antioxidant, anti-genotoxic, cytotoxic etc.

- **Valencene: -**

It is a sesquiterpene that is an aroma compound of citrus fruit & citrus-derived odorants; it is mainly obtained from valencia oranges; it is anti inflammatory, anti allergy, beneficial for skin; it is present in orange, tengerina, mango, grape (fruit).

- **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.

- **Beta carotene: -**

It is an anti oxidant that converts into vitamin A & plays a very important role in human health; it is responsible for the red, yellow, orange colouration in some fruits & vegetables. It promotes eye health & prevents eye diseases.

Main sources of beta carotene: -

It is present in pumpkin, carrot, sweet potato, dark leafy vegetables, apricot, red & yellow pepper, spinach, kale, grapes etc.

Basic pharmacokinetics of beta carotene (based on human intake in natural food products):

It is absorbed in intestine by passive diffusion & get convert into provitamin A in the presence of bile acids, the intestinal mucosa plays a key role in converting it into provitamin A. It is transported in blood plasma exclusively by lipoproteins. The complete absorption, metabolism & excretion is not known fully. It is stored in fats & liver.

Basic clinical pharmacology of beta carotene: -

It is anti oxidant, reduces risk of lung cancer & promote lung health, reduces free radicals thus prevents cancer & heart disease, diabetes, promotes skin health, improves complexion, hair health, eye health, brain health; reduces pimple, acne & other skin problems.

- **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, quince, pumpkin 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 include sugar, glycogen, starch, dextrin, fiber & cellulose that contain only oxygen, carbon & hydrogen. It is classified in simple & complex; simple carbs are sugar & complex carbs are fiber & 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, quince, pumpkin, grapes 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. 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, broccoli, cauliflower, sprouts, capsicums, papaya, strawberries, spinach, green & red chilies, cabbage, leafy vegetables, tomato, cereals, quince, pumpkin, grapes 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, fish oil, carrot, green leafy vegetables, citrus fruit, sweet potato, spinach, kale, quince, pumpkin, grapes 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, banana, quince, wheat germ, liver, egg, meat, dairy products, nuts, peas, fruits, vegetables, cereals, rice, breads, oats, pumpkin, grapes 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 quince, pumpkin, grapes etc.

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 acts 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, quince, pumpkin, grapes 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, quince, meat, chicken, liver, kidney, fish, grains, milk, dairy products, legumes, pumpkin, grapes 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, quince, chicken, bread, egg, vegetable, soyabean, whole grain cereals, brown rice, fish, legumes, beef, nuts, beans, liver, citrus fruits, starchy vegetables, potato, pumpkin, grapes 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 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, quince, dark green leafy vegetables, fruits, nuts, beans, dates, seafood, egg, dairy products, meat, chicken, legumes, beetroot, citrus fruits, broccoli, spinach, cereals, pumpkin, grapes 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.

- **Vitamin B12: -**

It is called as Cobalamin, it is water soluble, it is involved in metabolism of every cell of body, it is a cofactor in DNA synthesis, myelin, fatty acids & protein, it is important for nervous system, it acts on red blood cell maturation; it is very less present in vegetables. When we eat animal source for it, B12 is protein bounded. Our body cannot produce it we need to consume it in food sources.

Main sources of vitamin B12: -

It is present in fish, meat, egg, milk, dates, organ like liver, kidney, olive fruit, grapes etc.

Basic pharmacokinetics of vitamin B12: - (based on human intake in natural food products):

It is absorbed in ileum (small intestine), when humans eat animal food the B12 is protein-bound. When the protein-B12 complex reaches the stomach, the stomach secretes acids and enzymes that detach the B12 from the protein. Then in a process unique to B12, another protein, R-protein (aka cobalophilin, haptocorrin, and transcobalamin picks up the B12 and transports it through the stomach and into the small intestine. R-protein is found in many fluids in the human body including saliva and stomach secretions. The stomach cells also produce a protein called intrinsic factor (IF), which travels to the small intestine. When the corrinoid-R-protein complex gets to the small intestine, the corrinoid is liberated from the R-protein by enzymes made by the pancreas. Of the liberated corrinoids, only the cobalamins attach to intrinsic factor. Intrinsic factor then carries the cobalamins to the last section of the small intestine, the ileum. The cells lining the ileum contain receptors for the cobalamin-IF complex. The cobalamin-IF complex protects the cobalamin against bacterial and digestive enzyme degradation. The IF-receptor also ensures that cobalamins will be given priority for absorption over non-cobalamin corrinoids. In addition to the IF mechanism, passive diffusion normally accounts for 1-3% of B12 absorbed when obtained through normal food sources. Some inactive B12 analogues are most likely absorbed through passive diffusion. It is metabolized in liver & excreted in urine. It is stored in liver for years mainly.

Basic clinical pharmacology of vitamin B12: -

It helps in formation of Red blood cells, prevent anaemia, prevent birth defect, promotes bone health, prevent osteoporosis, reduces risk of macular degeneration in eyes, improves mood & prevents depression, help nerve function & promote nervous health, boost energy, improves heart health, nails, hairs, skin, memory, hormonal balance. It acts on wound healing, sooner recovery, ulcers, mouth ulcers etc.

Its deficiency causes anaemia, stress, weakness, stress, fatigue, delay wound healing, pain in nerves & tissues, joints, paleness, numbness in palms, feet etc. Diabetes & acidity medication reduces absorption of it in stomach & may lead to deficiency.

- **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, grapes.

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.

- **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; it is present in it; 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, pumpkin, grapes 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 takes 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, pumpkin, grapes 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.

- **Carotenoid: -**

It is a fat soluble; it is also called as tetraterpenoid; it is an organic pigment produced in plants giving them bright red, yellow, orange etc colour. It helps the plant to absorb light energy for photosynthesis; it protects our body from diseases & maintains health. It is of more than 600 types of which 50 to 60 types are eaten in food by human. It is not made by our body we depend on food source to be eaten.

Main sources of carotenoid: -

Carotenoid is present in olive oil, watermelon, tomato, kale, oranges, olive, carrot, plums, apricots, mango, sweet potato, kale, spinach, coriander, grapes etc.

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

It is fat-soluble; It first gets emulsified followed by solubilized in micellar then require bile salts & absorbed in intestine, little is absorbed in stomach; it is excreted in stools (research in on), it is stored in body fats and will convert the stored carotenoid into vitamin A when needed by the body and use it.

Basic clinical pharmacology of carotenoids: -

It is converted into vitamin A in our body, it is essential for vision, immune system, prevents cardiovascular disease, it helps reducing inflammation, cancers risk.

- **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; pumpkin has very less amount of sodium; vegetables & fruits have less sodium in them which is good for the body. It is present in beans, meat, fish, chicken, chili, bread, rolls, milk, celery, beetroot, grapes 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, quince, milk, banana, cheese, green leafy vegetables, soya beans, nuts, fish, meat, egg, bread, flour, yogurt, almonds, kale, soybean, spinach, pumpkin, grapes 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, quince, meat, dates, spinach, egg, nuts, dark leafy green vegetables, broccoli, pumpkin seeds, chicken, legumes, fish, banana, cabbage, kidney, almonds, pumpkin, grapes.

Meat is the best source of iron; it provides Fe⁺² directly which can be transported from intestine to blood stream through Fe⁺² 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 Hemoglobin (hemoglobin 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 hemoglobin level in blood) (this causes reduced in oxygen carrying capacity & supply of it); most of the iron is present in hemoglobin, it consists 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.

- **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 watermelon, quince, spirulina (water-plant), nuts, seeds, lobster, leafy green vegetables, guava, grapes, green olive, kiwi, mango, pineapple, pomegranate, egg, grapes etc.

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.

- **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, quince, spinach, meat, egg, nuts, dark leafy green vegetables, broccoli, pumpkin seeds, dates, chicken, fish, legumes, pumpkin, grapes 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 acts 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, quince, meat, nuts, beans, fish, chicken, dairy products, soy, grains, lentils, pumpkin, grapes 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, quince, meat, fish, legumes, beans, egg, dairy products, seeds, nuts, whole grains, pumpkin, grapes 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 & metallophionein. 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. Metallophionein binds to zinc to make it unavailable & excrete it in stools when zinc is excess in the body, & production of metallophionein 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 improves learning, memory, fertility etc. It heals acne, attention deficit hyper activity disorder (ADHD), osteoporosis, pneumonia etc.

- **Sugar (fructose): -**

Sugar present in quince mostly is fructose; meaning that blood sugar is not changing much after eating it (but diabetic patients should not eat much of it); Different varieties of quince has different ratio of fructose in it.

Main sources of fructose: -

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

- **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, cucumber, grapes 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.

- **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, grapes 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.

- **Betaine: -**

It is water soluble amino acid glycine; it is derivative of choline (choline is precursor of it) means body needs choline to synthesized betaine. It is also called as trimethylglycine (TMG) it has 3 methyl group attached to it; it was first discovered from beetroot & is called as betaine.

Main sources of betaine: -

It is present in watermelon, beetroot, wheat bran, spinach, grain, brown rice, sweet potato, beef, quinoa, grapes etc.

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

It is absorbed in duodenum more than jejunum via sodium & chloride dependent transport & passive sodium independent transport system; it is rapidly absorbed in around 17 minutes & released into blood stream quite fast & its absorption is near complete; it is excreted very little in urine in form of dimethylglycine (DMG) & little in stools, eliminated mainly via metabolism not excretion. It is stored in all organs (including brain) (it crosses blood brain barrier), skeletal muscles.

Basic clinical pharmacology of betaine: -

Betaine is a methyl donor, this means helps in liver function, cellular function & detoxification, process fats; it converts blood homocysteine into methionine. Homocysteine is an amino acid, body naturally produces, high level of it can be harmful to arteries of heart & may cause cardio vascular disease, atherosclerosis by producing plaque in the arteries of heart & brain (may cause stroke), may also cause osteoporosis, visual abnormalities, blood clots, narrowing & hardening of vessels.

Methyl donors: -

It refers to nutrients involved in bio-chemical process called as Methylation; And this process reduces due to age & we depend on methyl donor foods like vitamin B12, B6, folate, choline, betaine etc so that acts properly.

- **Dietary fiber: -**

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 fiber 2) insoluble fiber.

Soluble fiber 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 fiber 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, grapes etc.

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

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

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

Basic clinical pharmacology of dietary fiber: -

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.

- **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, grapes 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.

- **Lycopene: -**

It is a phytochemical of bright red colour carotene & carotenoid; it gives the red colour to the watermelon & other vegetables & fruits like tomato, pink guava, pink grapes, papaya etc. but it is not found in cherry & strawberries, although lycopene is chemically carotene but it has no vitamin A.

Main sources of lycopene: -

It is present in watermelon, olive, pink grapes, papaya, pink guava, grapes etc.

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

Absorption of it requires bile salts & fats to form a colloidal liquid & mostly absorbed in intestines. It is stored in the body in liver, testes, adrenal glands, ovaries, lungs, prostate gland & plasma; its excretion is

not unknown. But if taken in higher doses it was found to be excreted in urine & stools both depending on the dose but when intake in natural fruits or vegetables the amount of it present is very little, that do not matter how it is excreted.

Basic clinical pharmacology of lycopene: -

It is a powerful antioxidant & anti-inflammatory thus prevents many types of cancers; it also reduces risk of cardio vascular disease because it helps in keeping the blood pressure normal; it prevents skin from various changes & degeneration, due its antioxidant action cleaning the skin from harmful effects of UV rays; it removes free radicals from the body which float in the body disrupting cells & causing deadly diseases like cancer, asthma, auto-immune diseases etc; it is also helpful in hair health & its problems; it inhibit 5 alpha reductase (means dihydrotestosterone blocker) & reduces PSA (prostate specific antigen) thus helpful in prostate enlargement & prostate cancer; also makes bones strong.

- **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, grapes 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.

- **Beta-sitosterol: -**

It is among phytosterols & a main dietary phytosterol found in plants. It is anti cancer, anti-inflammatory, it improves urine flow, reduces symptoms of heart diseases, reduces cholesterol, boost immune system, reliefs bronchitis, migraine, asthma, fatigue, rheumatoid arthritis, improve hair quality, reliefs prostate problems, improves erectile dysfunctioning, psoriasis, libido.

Main sources of beta-sitosterol: -

Canola oil, avocados, almond, soya bean oil, nuts, vegetable oil, dark chocolate, rice bran oil, wheat germ, corn oil, peanuts, grapes etc.

- **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.

- **Tannin: -**

It is of astringent (dry & puckery feeling in mouth) taste, it is a polyphenol present in many plants, fruits, plant's wood, bark, leaves, skin, seeds etc. It is also called as Tannic acid; it is of 2 types hydrolysable & condensed. Hydrolysable is decomposable in water & reacts with water & form other substance. Condensed form is insoluble & precipitates, it is called as tanner's reds. But most of tannic acid is water soluble.

Main sources of tannin: -

It is present berries, apple, barley, nut, tea, legumes, grapes, pomegranate, quince, oak wood, lemons, squash, grapes etc.

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

Its absorption, metabolism & excretion are yet not known & are under research. After ingestion its bioavailability is poor due to its large size, high affinity to bound to plasma protein & low lipid solubility. It gets hydrolyzed in glucose & release gallic acid & other compounds upon decomposition.

Basic clinical pharmacology of tannin: -

It is used internally & externally. Externally it cures & heals the condition when applied on cold sores, fever blisters, diaper rashes, bleeding gums, tonsillitis, skin rashes, white discharge, yellow discharge, minor burn etc. It is used as douche for vaginal disorders like white or yellow discharge.

In food it is used as flavoring agent & naturally present in fruits etc, it relieves & cures chronic diarrhea, dysentery, hematuria (blood in urine), pain in joints, persist cold, cancers etc, it reduces high blood pressure, high lipids in blood. It is anti aging, anti oxidant, anti bacterial, anti enzymatic. It is used in medicated ointments for piles.

If used excessive it can give toxic effects on skin & internally may reduce absorption of vitamin, cause stomach irritation, nausea, vomiting, liver damage, kidney damage. It should not be used in pregnancy, breast feeding & constipation.

- **Amino acids in grapes, raisins, grapes seeds & its oil: -**
- **Absorption & digestion of amino acid.**

When we eat high-protein foods, body breaks down protein into amino acids and peptides through digestive enzymes, such as pepsin & pancreas produces trypsin, chymotrypsin and other that aid in protein digestion.

Pepsin is the primary enzyme responsible for digesting protein; it acts on the protein molecules & breaks the bonds – called peptide bonds – that hold the protein molecules together. Next, these smaller chains of amino acids move in the stomach & then in small intestine where they're further broken down by enzymes released by the pancreas. Small intestine contains finger-like extensions called micro-villi. These structures enhance its ability to absorb dietary nutrients. Now the semi digested material pass through brush border and baso-lateral membranes of small intestine & di-tripeptides are absorbed by passive transport (facilitated or simple diffusion) or active transport (Na⁺ or H⁺ co-transporters) pathways. Di and tripeptides are more efficiently absorbed than free amino acids which in turns are better absorbed than oligopeptides. They're released into the bloodstream and used for various biochemical reactions.

Each amino acid has a different role in the human body. Upon absorption, some amino acids are incorporated into a new protein. Some fuel your muscles and support tissue repair. Others are used as a source of energy.

Tryptophan and tyrosine, for example, promote brain health. These amino acids support the production of neurotransmitters, leading to increased alertness and optimum nerve responses. Tryptophan also assists with serotonin production, lifting your mood and keeping depression at bay.

Phenylalanine serves as a precursor to melatonin, epinephrine, dopamine and other chemicals that regulate your mood and bodily functions. Methionine helps your body absorb selenium and zinc, two minerals that promote overall health. Some amino acids, such as isoleucine, play a vital role in hemoglobin production and glucose metabolism.

- **Tryptophan: -**

It is an amino acids (protein) that is useful in bio-synthesis of protein; it is essential in human because body cannot make it); it is a precursor of neuro-transmitter serotonin, melatonin, vitamin B3; it is a sedative also.

Main sources of tryptophan: -

Salmon oil, egg, spinach, milk, seeds, fenugreek seed, soy products, nuts, fish, meat, wheat, banana etc.

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

It is absorbed in small intestine & reached the blood circulation, it passes the blood brain barrier & in brain cells it is metabolized into indolamine neuro-transmitter, niacin, a common example of indolamine is serotonin derivative from tryptophan. Tryptophan is converted into serotonin in the brain & body; it is believed that tryptophan supplements should be taken with carbidopa, which blocks the blood brain barrier. (Serotonin (5HTP) 5 hydroxytryptamine, is a monoamine neuro-transmitter. It contributes in feelings of well-being, happiness, reward, learning, memory, many physiological functions).

In the pathway of tryptophan/serotonin, melatonin hormone is produced. Melatonin regulates sleep-wake cycle. It is primarily released by pineal gland in brain. It controls circadian (daily clock) rhythms.

Pineal gland releases it at night more & very little in day light. It improves immune system function.

Natural sources of melatonin are tomato, pomegranate, olive, grapes, broccoli, cucumber, barley, seeds, nuts etc.

Fructose malabsorption causes improper absorption of tryptophan in intestine thus leading to low level of it & may cause depression.

Basic clinical pharmacology of tryptophan: -

It is necessary for normal growth of infants; nitrogen balance in adults, it aids in sleep pattern, mood. It is necessary for melatonin & serotonin formation in body, it enhances mental & emotional well-being, manages pain tolerance, weight etc. it also helps in build muscle tissue, essential for vitamin B3 production, relieves insomnia, reduces anxiety, depression, migraine, OCD, helps immune system, reduces cardiac spasms, improves sleep patten etc.

- **Threonine: -**

It is an amino acid used in biosynthesis of proteins; it is an essential amino acid important for tooth enamel, collagen, elastin, nervous system, fats metabolism, it prevents fats buildup in liver, useful in intestinal disorders, anxiety, and depression.

Main sources of threonine: -

Cheese, chicken, fish, meat, lentil, black seed, nuts, soy etc.

Basic clinical pharmacology of threonine: -

It is useful in nervous system disorders, multiple sclerosis, spinal spasticity, makes bones, joints, tendons, ligament stronger, it helps the immune system, promotes heart health.

- **Isoleucine: -**

It is an amino acid that is used in the biosynthesis of proteins, it is an essential amino acid means the body cannot make it & we depend on food sources, it plays & helps many functions of the body.

Main sources of isoleucine: -

Meat, mutton, fish, cheese, egg, seeds, nuts, soybeans, milk, legumes, fenugreek seed etc.

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

It is absorbed in small intestine by sodium-dependent active transport. It is metabolized in liver.

Basic clinical pharmacology of isoleucine: -

It promotes glucose consumption & uptake, it is anti-catabolic, enhances athletic performance & best for pre-workout, it acts on wound healing, detox of nitrogenous waste in the body, stimulates immune

system, promotes secretion of many hormones, helps in hemoglobin formation, regulating blood glucose, energy in the body, built muscles, helpful to brain for its function.

- **Leucine: -**

It is branched chain amino acid (BCAA) it is ketogenic amino acid; it is necessary when we do exercise, it stimulates protein synthesis & assists in muscle building.

Main sources of leucine: -

Cheese, soybean, meat, nuts, chicken, seeds, fish, seafood, beans.

Basic clinical pharmacology of leucine: -

It helps regulate blood glucose, promotes growth, recovers the muscles & bone tissues, acts on production of growth hormones, repairs the tissues, essential for muscle building, it burns fats, controls obesity, promotes lean muscles growth.

- **Lysine: -**

It is an essential amino acid, which our body cannot prepare and we need to eat it from food sources. It necessary for many body functions, acts in building blocks of protein (muscles).

Main sources of lysine: -

Red meat, chicken, egg, fish, beans, lentils, wheat germ, nuts, soybeans, spirulina, fenugreek seed, shrimp, pumpkin seed, tuna, cheese, milk etc.

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

It is absorbed from the lumen of the small intestine into the enterocytes by active transport, it undergoes first pass metabolism in liver & is metabolized in liver.

Basic clinical pharmacology of lysine: -

It helps the body in tissue growth, repair muscles injury, promote collagen formation, help the body to produce enzymes, antibodies, hormones, supports immune system, its deficiency causes fatigue, irritability, nausea, hair loss, anorexia, inhibited growth, anemia, problems with reproductive system, it is very helpful in treating cold sores (herpes), control blood pressure, diabetes, osteoporosis, helps athletes performance, helpful in treating cancers, reduces anxiety, increase absorption of calcium, improves digestion & prevent leaky gut, helpful in pancreatitis.

- **Methionine: -**

It is a sulfur containing amino acid; it is essential; it plays a critical role in the metabolism & health; it act on normal cell functioning, growth & repair. It is also a chelating agent for heavy metals; due to its sulfur contain it is helpful in hair, nail health & growth & good for skin health; it reduces cholesterol by increase the production of lecithin in liver & reduces fats formation in liver, also protects kidneys, liver from hepatotoxins, it is an antioxidant. It is absorbed in lumen of small intestines into enterocytes by active transport & metabolized in liver.

Main sources of methionine: -

Meat, mutton, fish, chicken, cheese, egg, beans, milk, nuts, shellfish etc.

- **Cystine: -**

It is the oxidized dimer form of amino acid, it is nonessential; the body uses it to produce taurine & other amino acids; it is a sulfur containing amino acid; our body uses vitamin B6 with the help of cystine; it heals burns, wounds, bronchitis, assist in supply of insulin, it increases level of glutathione in liver, lungs, kidneys & bone marrow. It is anti aging, anti inflammatory, anti arthritis, anti rheumatoid arthritis.

Main sources of cystine: -

Meat, egg, milk, garlic, onion, broccoli, oats, wheat germ, lentils etc.

- **Phenylalanine: -**

It is an aromatic essential amino acid in human; it plays a key role in biosynthesis of other amino acids; it is important in the structure & function of many proteins & enzymes. It is precursor of melanin, dopamine, noradrenalin hormone, thyroxin hormone. It is converted in tyrosine & used in biosynthesis of dopamine & noradrenalin. It improves memory, reduces pain of hunger; it is anti-depressant; it is also a building block protein; it is useful in vitiligo, depression, ADHA, parkinson's, multiple sclerosis, pain, osteoarthritis, rheumatoid arthritis, fat burn & helpful in alcohol withdrawal symptoms.

Main sources of phenylalanine: -

Pumpkin seed, nuts, seeds, soy, meat, fish, chicken, egg, beans, milk etc.

- **Tyrosine: -**

It is a nonessential amino acid; it is also called as 4-hydroxyphenylalanine; it is useful in cell synthesis of protein; it is a building block protein; body prepares it from phenylalanine. It is a precursor & used to produce noradrenalin, dopamine, & thyroxin & melanin hormones. It reduces stress, improves memory, it promotes growth, mental health, skin health, fat burn. It acts as a mood elevator, anti-depressant, improves memory, mental alertness, its deficiency can cause hypothyroidism leading to low blood pressure, low body temperature (hypothermia), stress, fatigue, narcolepsy; it helps thyroid gland, adrenal gland, pituitary gland to function properly. It is absorbed in small intestine by sodium-dependent active transport; after absorption it reaches the blood & crosses the blood brain barrier (BBB) & enters the brain cells & gets metabolized into catecholamine (noradrenalin). Human body regulates it amount by eating it by food sources & making inside the body (nonessential). The body does not store it much for later uses.

Main sources of tyrosine: -

Meat, fish, egg, milk, nuts, beans, oats, wheat, black seeds etc.

Dopamine: -

It regulates reward & pleasure centers in brain; it is a chemical important for memory, motor skills & etc.

Nor-adrenaline & adrenaline: -

These hormones are responsible for fight & flight response in stressful situation & also controls many functions of the body; it is secreted by adrenal glands.

Thyroxin: -

It is secreted by thyroid gland; it regulates metabolism, blood pressure, digestion, energy etc.

Melanin: -

It is pigmented hormone, gives our skin, hair, eye their colour; dark skinned people have more melanin in their skin than light skin people (depend on exposure to sunlight).

- **Valine: -**

It is an essential nutrient for vertebrates, biosynthesis of protein; it is an aliphatic & extremely hydrophobic essential amino acid; it is branched chain of amino acid (BCAA); it is important for growth, repair, blood glucose regulation, for energy; it stimulates CNS, proper mental function.

Main sources of valine: -

Cheese, soy, beans, nuts, fish, meat, chicken, mushroom, seeds, nuts, whole grains etc.

- **Histidine: -**

It is an amino acid used in biosynthesis of protein; it is semi essential amino acid, needed by human for production of histamine & also for growth & tissue repair, it is helpful in maintaining myelin sheaths that covers the nerves & protects the nerves.

Main sources of histidine: -

Meat, mutton, fish, milk, egg, seeds, nuts, chicken, cheese, soy, beans, whole grains, fenugreek seeds.

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

It is absorbed in small intestine via active transport requiring the presence of sodium.

Basic clinical pharmacology of histidine: -

It plays many roles in immunity, gastric secretion & sexual functions. It is also required for blood cell formation & protects tissues against damage of radiation & heavy metals. It keeps normal pH of 7 in the body, useful in rheumatoid arthritis, allergy, ulcer & anemia caused by kidney failure or dialysis. It is an antioxidant, anti inflammatory, reduces cholesterol.

- **Arginine: -**

It is among conditional essential amino acid the body needs to function properly; it is made in liver; it plays an important role in building protein thus helpful in body building.

Main sources of arginine: -

Chicken, pumpkin seeds, spirulina, dairy products, red meat, fish, egg etc.

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

It is absorbed in jejunum mainly from oral diet.

Basic clinical pharmacology of arginine: -

It releases nitric oxide in the blood & nitric oxide dilates the blood vessels thus increases the blood supply & controls high blood pressure, it improves erection, builds muscle etc. it also acts on release of growth hormone, insulin & other substances in the body. It also improves heart health, athlete performance, stimulates immune system; citrulline present in watermelon is converted into arginine in kidneys, please refer lesson on watermelon.

- **Alanine: -**

It is a non-essential amino acid that is present in blood plasma in its free state in high levels; it is involved in sugar & acid metabolism, protein synthesis, it increases immunity, provides energy for muscles tissues, brain & CNS, it acts on tryptophan, vitamin B6 metabolism; it is an important sources of energy for muscles; it helps the body to convert simple sugar (glucose) into energy; it is produced in the body. It increases exercise capacity; reduces muscle fatigue, boost immunity, it is antioxidant; anti-aging; increases muscle growth; ideal pre & post workout, reduce blood sugar, prevent liver disease, helps the liver to eliminate toxins, improves CNS functioning, helpful in benign prostate hypertrophy. It is digested in small intestine; it is converted into pyruvic acid by alanine aminotransferase-1; during fasting condition alanine derived from protein breakdown is converted into pyruvate & used to synthesis glucose by gluconeogenesis in liver, it is excreted in urine via urea cycle. It is stored little in skeletal muscles.

Main sources of alanine: -

Meat, fish, egg, milk, aloe vera, honey, black seeds, nuts etc.

- **Aspartic acid: -**

It is a non-essential amino acid; it is over all negatively charged & plays an important role in synthesis of other amino acid, citric acid & urea cycles; it is found in animals, plants, sugarcane, sugarbeet. It may be a neurotransmitter; it strengthens the muscles, improves heart function, helps in maintaining mental

health, reduces tiredness, improves athletic performance, increases muscle size, reduces depression & fatigue. It is absorbed in small intestine by active transport.

Main sources of aspartic acid: -

Meat, oysters, seeds, oats, avocado, sugar beet, milk, egg, nuts, cereals etc.

- **Glutamic acid: -**

It is a nonessential amino acid. It is an excitatory neuro-transmitter; it is necessary for biosynthesis of proteins; body uses it for several key functions within the body like making other neuro-transmitters such as GABA; it promotes brain health, muscles health, intelligence, mood & mental alertness. It is called as chemical messenger. It plays an important role in body's disposal of excessive waste like nitrogen. It is absorbed in lumen of small intestine into enterocytes by active transport & excreted in urine mainly. It is almost about 2 kilo grams, storage in natural form in brain, kidneys, liver, muscles etc.

Main sources of glutamic acid: -

Meat, chicken, fish, egg, milk, wheat, mushroom, soy, broccoli, walnut, peas etc.

- **Glycine: -**

It is a nonessential amino acid that body needs for growth & maintenance of tissue & need to prepare hormones & enzymes. It is inhibitory neurotransmitter. It helps in preparing glutathione (a powerful antioxidant & reduces free radicals, delay aging). It is helpful in preparing of creatine (provides energy to muscles to perform exercise etc & acts on muscle contraction), beneficial for brain health, bone health, alzheimer's, schizophrenia, sleep disorder, stroke, burns, protects kidney & liver from harmful side effects of drugs used after organ transplant, heals wound & ulcers, it is anti inflammatory, improves skin health.

Main sources of glycine: -

Meat, fish, milk, legumes etc.

- **Proline: -**

It is a protein-genic amino acid used in biosynthesis of proteins. It heals cartilages, cushion joints, tendons, ligament, heart muscles, connective tissues & helps in formation of collagen.

Main sources of proline: -

Soy, pumpkin seed, lentils, black beans, quinoa etc.

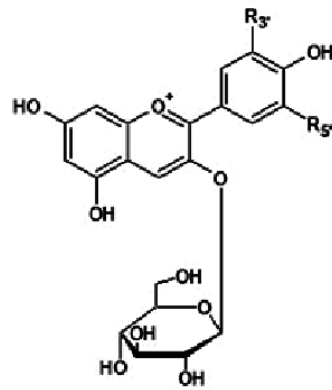
- **Serine: -**

It is a nonessential amino acid, important for synthesis of protein, fats metabolism, muscle growth, immune system; it is a precursor of many amino acids, helpful in enzyme catalyze its reaction, overall health, physical & mental health.

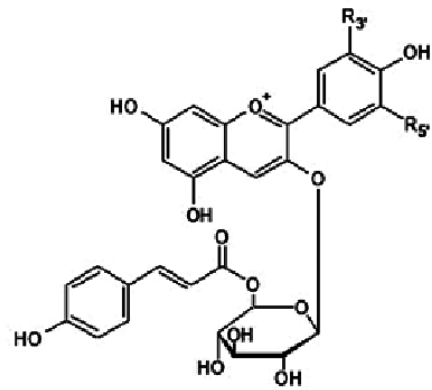
Main sources of serine: -

Soybean, egg, lentils, meat, fish, nuts, almonds, walnut etc.

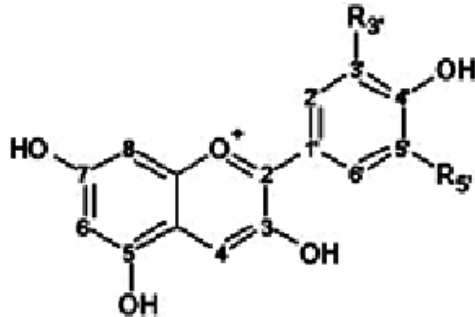
- **Main chemical structures of grapes & raisins: -**



Anthocyanidin-3-O-glucoside

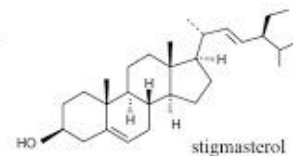
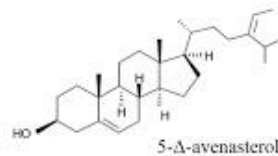
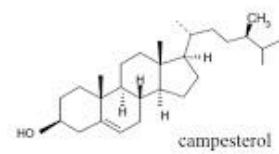
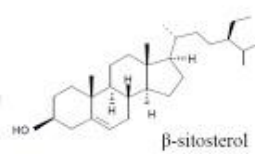
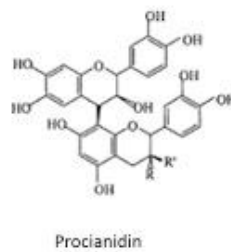
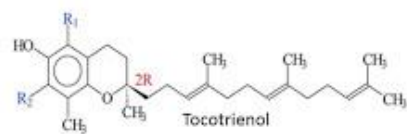
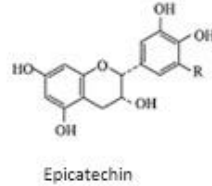
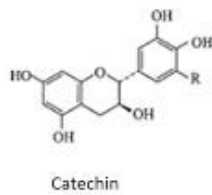
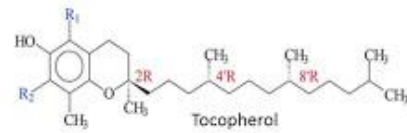
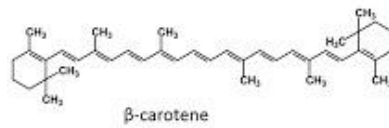


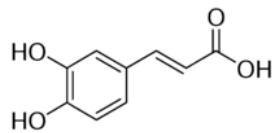
Anthocyanidin-3-O-(6''-*p*-coumaroyl)-glucoside



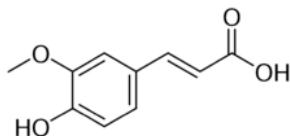
Basic anthocyanidin structure

R _{3'}	R _{5'}	Anthocyanidin
OH	H	Cyanidin
OMe	H	Peonidin
OH	OH	Delphinidin
OH	OMe	Petundin
OMe	OMe	Malvidin

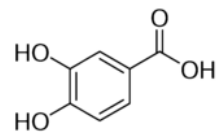




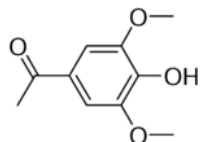
Caffeic acid



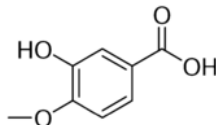
Ferulic acid



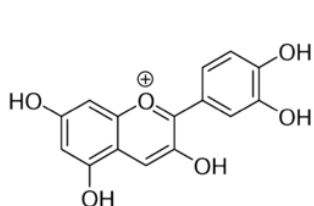
Protocatechuic acid



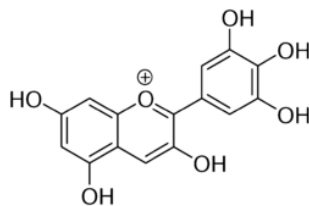
Syringic acid



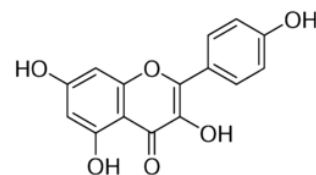
Vanillic acid



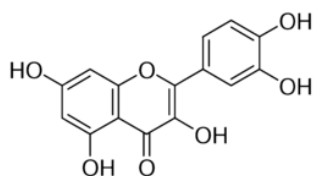
Cyanidin



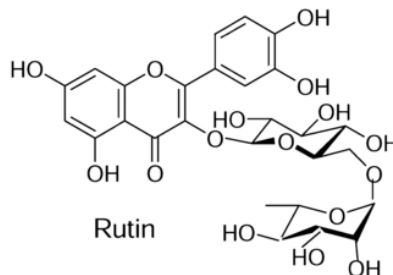
Delphinidin



Kaempferol



Quercetin



Rutin

Grapes - Nutritional Facts per 100 g

Nutrients mg Percentage

Folates	2 µg	0.5%
Niacin	0.188 mg	1%
Pantothenic acid	0.050 mg	1%
Pyridoxine	0.086 mg	7.5%
Riboflavin	0.070 mg	5%
Thiamin	0.069 mg	6%
Vitamin A	66 IU	3%
Vitamin C	10.8 mg	18%
Vitamin E	0.19 mg	1%
Vitamin K	14.6 µg	12%
Sodium	0%	1 mg
Potassium	191 mg	4%
Calcium	10 mg	1%
Copper	0.127 mg	14%
Iron	0.36 mg	4.5%
Magnesium	7 mg	2%
Manganese	0.071 mg	3%
Zinc	0.07 mg	0.5%



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- **Research: -**

SCIENCE & HADEES REGARDING GRAPES & DRIED GRAPES: -

Grape juice has recently been found to be an important source of Flavonoids that can lower risk for cancer, lower cholesterol, prevent hardening of the arteries and fight heart disease. In 1996 scientists noticed that although the French ate four times more butter and lard as Americans and had higher cholesterol and blood pressure that they had two and a half times less incidences of heart attacks. (Because French people drink grapes juice more). The general public was thrilled when the conclusion was finally made that the Flavonoids in red wine were responsible (wine is Haram), However, we can now celebrate over the recent finding that grape juice contains the same Flavonoids and nutrients as red wine (in about half the concentration) with none of the undesired side effects of alcohol (grapes wine).

Uses of Raisins in cold cough: Grapes are one of the most effective home remedies for the treatment of a cough. Grapes tone up the lungs and act as an expectorant (removes cough), it also relieves cold and cough in a couple of days. A cup of grape juice mixed with a teaspoon of honey is advised for cough relief. Grind up 3 ounces of raisins, adding water to make a paste. Add 3 ounces of white sugar, and heat the mixture until it forms a sauce. Allow to cool. Take half an ounce of the mixture every night at bedtime.

- **CONCLUSION OF RESEARCH: -**

1. Raisins (dried grapes) removes tiredness, cools anger, strengthens the organ & body, reduces phlegm, improves complexion & mood, brightens the face, and increases health.
2. 21 raisins are helpful in diseases or conditions causing inferior complex. Can drink its water soaked overnight (when alone soaked). Do not soak dates & Raisins together & nor drink.
3. Do not drink grapes wine or other wine. Do not use thick grape juice until reduces to 1/3 by boiling. Do not use its seeds.
4. Both grapes & raisins have antioxidant, anticancer, anti-inflammatory, preventive, curative, healing properties.
5. Both are cheap, easy available all season & can be sued in all season all age.

