Eating a Balanced Diet for Healthy Living in OI!

This write-up covers healthy eating suggestions for the general population including people with brittle bone condition (OI). People with special dietary needs or medical conditions should ask their doctor or a registered dietician for further advice. This article is written for educational/informational purposes and should not be substituted for medical advice. Kindly consult your doctor or nutritionist before trying any of the tips suggested or discussed.

Eating a healthy balanced diet is an important part of maintaining good health and can help you feel your best. This means eating a wide variety of foods in the right proportions and consuming the right amount of food and drink to achieve and maintain a healthy body weight for a healthy lifestyle. **Cena, H., & Calder, P. C. (2020)**

A balanced diet is important for people with osteogenesis imperfecta (OI) to promote bone development and health. This diet should include:

A variety of vitamins and minerals, Low levels of fat, salt, and added sugar Avoidance of excessive weight gain Consume enough calcium and vitamin D. Eat a healthy balanced diet including at least 5 fruits and vegetables a day to make sure you get all the vitamins and minerals that are needed for bone health. Eat enough protein - aim for meat, fish, dairy or plant-based alternatives (like tofu or pulses) twice a day. Your body needs plenty of protein to build new collagen for bone healing. Eat lots of protein-rich foods like lean meats, low-fat dairy products, beans, nuts, and fortified cereals. Leafy green vegetables like collard greens, spinach, broccoli, and kale are high in calcium, another important part of bone repair. A healthy balanced diet will help you build healthy bones from an early age and maintain them throughout your life. You need sufficient calcium to keep your bones healthy and vitamin D to help your body absorb calcium. When you have a fracture, your body needs it to build new bone for the repair. It also helps your body take in and use calcium, another key nutrient for healthy bones. Good sources: Meat, fish, milk, cheese, cottage cheese, yoghurt, nuts, seeds, beans, soy products, and fortified cereals, green juice is also packed with vitamin C, which helps form collagen to assist in strengthening bones. You can even juice romaine lettuce, kale, collard greens, and cilantro. **Ratajczak, A. E et al., (2021).**

What is Food?

Food is any nutritious substance that people or animals eat or drink or that plants absorb to maintain life and growth.

Importance of Food!

Food is man’s source of nutrients via vitamins and minerals. Nutrients nourish our cells and body for healing, health, and vitality. Fruit and vegetables are a good source of vitamins, minerals, and fibre, and should make up just over a third of the food you eat daily.

Where do vitamins and Minerals come from?
Vitamins are natural substances found in living things such as plants. They must be obtained into the body from foods or supplements as they cannot usually be produced by the body. Minerals are found in plants. Plants get their minerals from the soil. Soil gets minerals from water washing over rocks. For vitamins to do their job, they require minerals.

It's recommended that you eat at least 5 portions of a variety of fruits and vegetables every day. They can be fresh, frozen, canned, dried or juiced, but preferably, take them in their fresh and raw state. There is evidence that people who eat at least 5 portions of fruit and vegetables a day have a lower risk of heart disease, stroke and some cancers. Eating 5 portions is not as hard as it sounds.

Importance of Vitamin D in OI

There are two types of vitamin D: ergocalciferol, or vitamin D2, which is derived by irradiating plants, plant materials, or food, and vitamin D3, or cholecalciferol, which is produced in the skin following exposure to sunshine or UV light. Ninety percent of vitamin D is produced by sunshine on the skin (deep layers of the epidermis), where it is absorbed by the small intestine from 7-dehydrocholesterol. 25-hydroxyvitamin D3 (25(OH) vitamin D) is hydroxylated in liver microsomes. 1α-hydroxylase, which is encoded by CYP27B1, subsequently hydroxylates this vitamin D in the kidneys to produce active vitamin D (1,25(OH)2 vitamin D), often referred to as calcitriol. **Gnoli, M., et al., (2023).**

Osteogenesis Imperfecta (OI) is a defect where collagen (the protein that is responsible for bone structure) is missing, reduced or of low quality, so is not enough to support the minerals in the bone. This makes the bone weak, which in turn makes the bones easy to fracture. Vitamin D can help the strengthening of a child's bones.

Most likely, the first vitamin that comes to mind is calcium. However, vitamin D has an equally crucial role in maintaining strong bones and preventing osteoporosis, a condition that can cause brittle, weak bones. From a physiological perspective, by releasing calcium, vitamin D seems to have a role in each stage of the fracture healing process. The process is not well known, and there are contradictory findings indicating different quantities of metabolites during the healing period. **(The systematic review by Gorter et al (2017)) & Coccia et al., (2023)**

Here are ways to guide you into eating your 5-a-day portions. A portion is:

80g of fresh, canned or frozen fruit and vegetables
30g of dried fruit – which should be kept to mealtimes
150ml glass of fruit juice or smoothies – but do not have more than 1 portion a day as these drinks are sugary and can damage teeth.
Just 1 apple, banana, pear or similar-sized fruit is 1 portion each.

A slice of pineapple or melon is also 1 portion, and 3 heaped tablespoons of vegetables is another portion.
Adding a tablespoon of dried fruit, such as raisins, to your morning cereal is an easy way to get 1 portion.
You could also swap your mid-morning biscuit for a banana, and add a side salad to your lunch. In the evening, have a portion of vegetables with dinner and fresh fruit with plain, lower-fat yoghurt for dessert to reach your 5 A Day.

What are Free Radicals?

Free radicals are highly reactive and unstable molecules that are made by the body naturally as a by-product of normal metabolism. Free radicals can also be made by the body after exposure to toxins in the environment such as tobacco smoke and ultraviolet (UV) light. They are some of the root causes of sickness and disease. When we understand this very well, we will work on eliminating free radicals from our body system.
The body makes free radicals while breaking down nutrients to give us the energy we need to function. The production of free radicals during these normal processes in the body is one reason why our risk for many diseases goes up as we age even if we haven't been exposed to toxic substances.
Free radicals have a lifespan of only a fraction of a second, but during that time can damage DNA, sometimes causing mutations that can increase your risk of getting health conditions such as heart disease and cancer.

Sources of Free Radicals

Free radicals can come from normal metabolic processes in the body or exposure to cancer-causing substances known as carcinogens or other harmful substances in the environment such as Tobacco smoke, Ultraviolet radiation, Radon, Environmental and occupational substances and chemicals (e.g., asbestos and vinyl chloride), some viruses, Medical radiation, Air pollution and many more.

Effect of Free Radicals on the Body: Oxidative Stress

Once free radicals are made, they're free to do damage to the body—whether they came from exposure to a carcinogen or the normal processes of the body.
The availability of free radicals creates something called oxidative stress in the body. It's called "stress" because the chemical reactions that let free radicals get an electron occur in the presence of oxygen. There are several parts to this process. When one free radical "steals" an electron from a molecule, that molecule becomes a free radical because it's missing an electron. That cycle continues and makes more free radicals.
Free radicals can damage the body's DNA. Our DNA contains our genes, proteins, lipids, cell membranes, and other important substances. Damaged DNA can lead to disease and sickness.

How Free Radicals Can Cause Diseases like Cancer

Damage to genes in the DNA can cause them to make ineffective proteins. Some of those proteins are an important part of making sure the DNA is working right. A key area where damage can cause problems is in tumour suppressor genes. These genes direct the proteins that repair damaged DNA or cause cells that are damaged so badly that they can't be fixed to be removed through "programmed cell death" (apoptosis).
Usually, it's a series of mutations in tumour suppressor genes and other genes that lead a cancer cell to form.

Antioxidants and Free Radicals
The solution to a healthier life is antioxidant foods. Antioxidants are specific vitamins and minerals that protect the body's cells from the damaging effects of free radicals.
Antioxidants have “extra” electrons (the blue dots) that they can give to free radicals, which eliminates their harmful effects on human cells.
Antioxidants are your body’s natural defence system against destructive free radicals. Antioxidants in the foods we eat can neutralize the unstable molecules and reduce the chances of them causing damage. Many foods and drinks are good sources of different antioxidants.
Therefore, they are your defence against ageing, sickness and disease. Consuming a balanced diet rich in antioxidants, vitamins, and minerals can support stem cell production.

Benefits of Diet and Nutrition to Preventing Free Radicals:
Many of the plant chemicals (phytochemicals) in our foods are antioxidants. These nutrients stop the formation of free radicals and may reduce the damage they would cause in the body. The power of antioxidants to fight free radicals is one reason why a diet rich in vegetables and fruits has been linked with a lower risk of many diseases.

Examples of antioxidants that may help combat free radicals and oxidative stress include: Vitamin E, Vitamin A, Beta-carotene, Anthocyanins, Epigallacatechin-3-gallate (EGCG).

Disease Preventing and Defeating Foods:
The Mediterranean diet comprises of healthy food rich in antioxidants, and they are primarily made up of the following foods listed below:

Extra-virgin olive oil and Avocado:
Both olive oil and avocado oil are considered good fats, and heart-healthy oil, and have been shown to reduce inflammation and protect against heart disease

Whole Grain Bread:
One of the easiest swaps you can make for a health boost is replacing refined flour in place of whole wheat or grains.

Whole-Grains Cereals:

Whole grains are associated with various health benefits, including a lower risk of diabetes, heart disease, and high blood pressure.

Whole-grain Pasta, Wild rice, Couscous, Bulgur, and Potatoes:
They are packed with vitamins, minerals, and fibre. They are a good source of fibre and fibre is good for your health, it can stop blood sugar from spiking and can keep you fuller longer as fibre keeps cholesterol and blood sugar levels in check. It also can help lower cholesterol, which can reduce your chances of chronic illnesses and diseases like cancer and heart disease.

Fruits and Vegetables:
Fruits and vegetables are an excellent source of essential vitamins, minerals, and dietary fibre which can help maintain a healthy gut and prevent constipation and other digestion problems. A diet high in fibre can also reduce your risk of bowel cancer.

Fruits also provide a wide range of health-boosting antioxidants, including potassium, vitamin C, folate, and flavonoids. Diets rich in potassium may help to maintain healthy blood pressure. They're low-calorie and low-fat, they have lots of fibre and help you maintain good health.

Green Leafy Vegetables:
Vegetables particularly dark leafy green vegetables are packed full of vitamins, minerals, fibre, antioxidants, anti-inflammatory compounds, and an array of phytonutrients, which all act to support a healthy immune system. Dark green variety, especially in salads or smoothies provides a decent amount of nutrients to the body.

Nuts:
Nuts contain a high quantity of calories, essential unsaturated and monounsaturated fats including linoleic and linoleic acid, vitamins, and essential amino acids. Many nuts are a good source of vitamin E, vitamin B, folate, fibre, and essential minerals such as magnesium, phosphorus, potassium, copper, and selenium which provide nutrients to our body.

Seeds:
The kernel of the seeds of fruits like apples, plums, pears/avocados, peaches, cherries, and apricots is a good source of Vitamin B17. They are sources of magnesium, antioxidants, amino acids, Vitamin B3, proteins, and phosphorus. These additional nutrients may assist with digestive health, respiratory functions, immunity, inflammation, and many more.

Beans and Legumes:
Beans and Legumes are among the most versatile and nutritious foods available. Legumes are typically low in fat, contain little or no cholesterol, and are high in folate, potassium, iron, and magnesium. They are a great source of protein which is an essential nutrient to humans. They contain amino acids, which are protein-building blocks that the body uses to heal and make new tissues, such as bones, muscles, hair, skin, and blood.

They are excellent sources of dietary fibre, iron, B vitamins, folate, and many other important vitamins and minerals which may help prevent disease. Foliate is essential for overall health makes healthy red blood cells and helps prevent neural tube defects in a foetus during pregnancy. They are a source of antioxidants that fight the effects of free radicals, which are damaging chemicals that the body produces during metabolism and other processes, thereby reducing the risk of cancer and heart disease. There is good evidence that they can help reduce blood sugar levels, improve cholesterol levels and help maintain a healthy gut.

Cheese and Yoghourt:
Organic pastured raw cheddar cheese is also an excellent source of protein, healthy fat, probiotics, calcium, and several other nutrients. It may aid weight loss and help prevent heart disease and some others.

They are higher in nutritional value, quality and health. It reduces the chances of your body absorbing any chemicals used in farming. Use the reduced-fat varieties and small amounts of low-fat organic cheese can be grated on soups or entrees. (The fat-free cheeses often taste like rubber.)

Include the following foods in your Mediterranean diet a few times weekly:

Organic or Free Range Chicken:
If you're going to choose chicken as a protein source in your diet, you want to make sure that it's both organic and free-range chicken. One of the healthiest things about free-range chicken is its high protein content. Just one free-range chicken breast can supply around 52 per cent of most people's daily protein needs. Protein is so crucial to the health of our bodies.

Free Range Eggs:
Free-range chickens are known for producing eggs that are much more nutritionally dense than the eggs laid by caged hens. Poultry should be eaten two to three times weekly. Eat white breast meat with the skin removed.

What are Supplements?
Supplements are vitamins and minerals that have been extracted from a plant or created in a laboratory and put into a form that can be ingested and used by the human body. They are sources of antioxidants which are specific vitamins and minerals that protect the body cells from the damaging effects of free radicals.

Why should you take Vitamin and Mineral Supplements?
Vitamins and minerals are vital nutrients for bodily functions and prevention of disease. There is an archaic argument of "I can get everything I need from food". Are you? In a large 26,000-person study it was concluded that not one person received the nutritional

requirements set forth by the RDA (Recommended Daily Allowance). 96% of the US population dies of a disease – people are not getting proper nutrition.

The following are reasons why vitamins/mineral supplements are necessary:
Crop nutrient losses, Poor digestion, Over-cooking, Microwave cooking, Food Storage, Food selection, Food Omission, Environmental factors, Antibiotics, Poor lifestyle habits, Stress, out of balance, Nutrient variance "Insufficient vitamin intake is a cause of chronic diseases… Most people do not consume an optimal amount of all vitamins by diet alone. Pending prudent for all adults to take vitamin supplements." – Journal of the America Medical Association - June 2002.

Water: The Ultimate Health Drink
Water is important for life and it is essential for the proper functioning of the human body. The human body is around 75% water; why not consume the best to stay healthy?
The amount of water a person needs to drink daily varies depending on their age, sex, weight, and activity level. The NHS recommends that adults drink 6-8 glasses of water per day.
Water is the best drink for your health, so make sure you drink enough every day.
Carry a water bottle, choose water over sugary drinks, and enjoy the benefits of plain water.
Drinking water has numerous health benefits that you may not know about to the human body.

The advantages of drinking water are:

- It helps regulate body temperature.
- It lubricates and cushions joints.
- Protect sensitive tissues, and get rid of waste products.
- Drinking water also boosts energy levels, metabolism, and skin care.
- May help with weight loss, digestion, headaches, and osteoporosis.
- It is crucial for all the cells and organs of the body to function properly.
- Water is involved in the production of hormones and neurotransmitters, and dehydration can affect brain structure and function.
- It protects our organs and tissues while moistening tissues in the eyes, nose and mouth.
- It helps to transport nutrients and oxygen to the body cells.
- Water helps to lessen the burden on the kidneys and liver by flushing out waste products and toxins. The kidneys play a key role in balancing fluid levels in the body and drinking water can prevent kidney damage.
- Dissolves minerals and nutrients to make them accessible to the body.
- It boosts your physical performance, energy levels, and brain function, especially when you are dehydrated or exercising.
- Helps with weight loss by increasing metabolism and reducing appetite.
- Water can lower your blood pressure; and protect your teeth from decay.

- Prevent kidney stones by keeping your blood and urine diluted.

Water: The Ultimate Health Drink

The human body is around 75% water, and then why not consume the best water that can prevent ill health, and restore and maintain health?

Alkaline water has been proven to hydrate one faster and longer than regular drinking water due to its high potential hydrogen. Regular drinking water is typically neutral with a pH level of 7 and alkaline water is slightly basic with a pH level of about 8 or 9 upwards while acidic water is from 6 downwards. There are several incredible health benefits to drinking alkaline water that have been scientifically proven and below are some of them:

Alkaline ionized water is the best water and its benefits include:

- Reduction of oxidative damage to DNA, RNA, and proteins in humans.
- Increase longevity that is one is aged less.
- Enhanced hydration, and efficient lactate utilization resulting in increased energy.
- Suppresses the growth of cancerous cells and microorganisms.
- Reduce high blood pressure, blood sugar levels, and cholesterol.
- Telomere shortening in cancer cells.
- Reduction of neuron degeneration.
- Reduction of blood viscosity and increase of oxygen supply.
- Improve bone health by reducing bone resorption.
- Reduction of acid reflux triggered damage through pepsin deactivation.

The idea that alkaline water is medicinal, curative, and able to bring about optimal health seems to be based on the belief that acidic properties in the body and blood are the cause of ill health and disease and need to be neutralized.

Therefore, a more alkaline body will lead to better health. In summary, make sure you drink enough water every day to stay hydrated and healthy!

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