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RO Water Effect on Human Body

Sagar Baban Nimone, Rekha Goukonde, Dr. Gajanan Sanap
Late Bhagirathi Yashwantrao Pathrikar College of D Pharmacy (D & B Pharm), Pathri, Maharashtra

Abstract: *Reverse osmosis (ro) water sanctification is extensively used to remove pollutants from drinking water, making it safer for mortal consumption. Still, the process also removes salutary minerals similar as calcium, magnesium, and potassium. This review discusses the implicit goods of consuming ro water on mortal health, with a particular focus on mineral insufficiency and affiliated health issues. While ro water can enhance hydration and reduce exposure to dangerous substances, dragged input of demineralized water may contribute to scarcities in essential nutrients, potentially impacting bone health, cardiovascular function, and overall metabolic processes. The slightly acidic nature of ro water could further impact sits effect on the body, especially in individualities with certain health conditions. To alleviate these pitfalls, strategies similar as remineralizing the water or icing an acceptable salutary in of calcput of minerals are recommended. This paper emphasizes the significance of balancing water chastity with mineral input to maintain optimal health issues when using ro water for long- term consumption.*

Keywords: insufficiency part of calcium in bone development, osteoporosis, lack of sodim, rear osmosis process, disese cause due to insufficiency of essential mineral

I. INTRODUCTION

Although there are some similarities between the ro and other membrane technology applications, like ultra-filtration, there are also some distinctions. Pore diameters are bigger in filtering than in ro membranes, and the removal process is size exclusion or straining. Regardless of operational variations, such as pressure and solute concentrations, the ultra-filtration process, at least in theory, provides good particle exclusion .however, due to the higher pore sizes, all heavy metals, microbiological agents, and inorganic components pass through the ultra-filtration process. Ro's separation effectiveness is dependent on the solute content (tds), pressure used, and water temperature because it operates through a diffusive process. N reverse osmosis (ro) systems, high-pressure pumps push water (permeate) through the membranes' pores while pushing out the wastewater (brine), which contains higher solute concentrations . A ro system's fundamental parts are shown in figure 1.

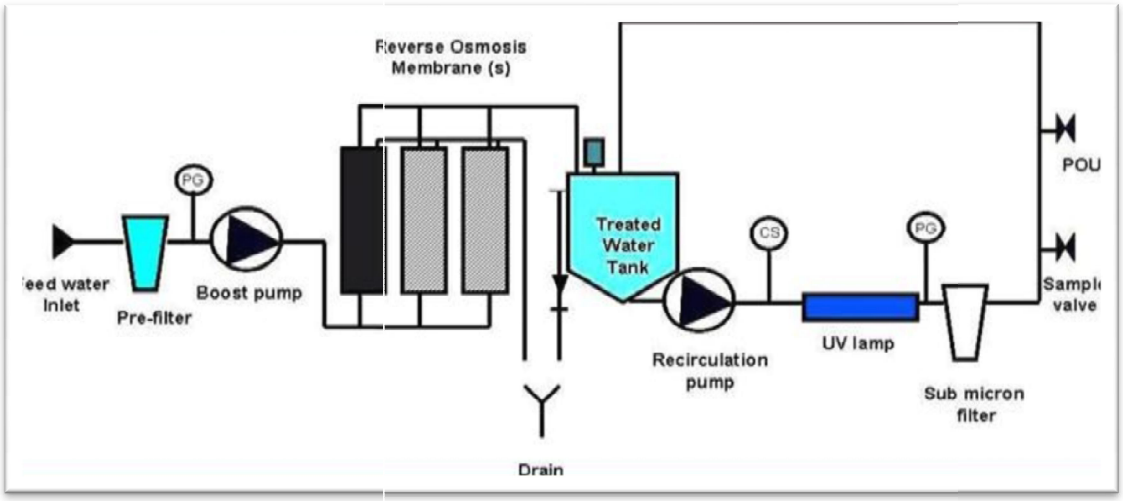

Figure No 1:-Basic Component Of Reverse Osmosis

One of the main advantages of ro is its capacity to eliminate heavy metals, fluoride, and agrochemicals from water in addition to toxins and salinity. Most alternative approaches, such as activated charcoal filters and even ultra-filtration-

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based technologies, are unable to eliminate these ionsLarger ro units can recycle some of the energy that would otherwise be squandered to run the pressure pumps, permeate pumps, or other electrical appliances when the high-pressure water output is coupled to a turbine or engine. Figure 2 shows the flow cycle and mechanical parts of a typical ro system.

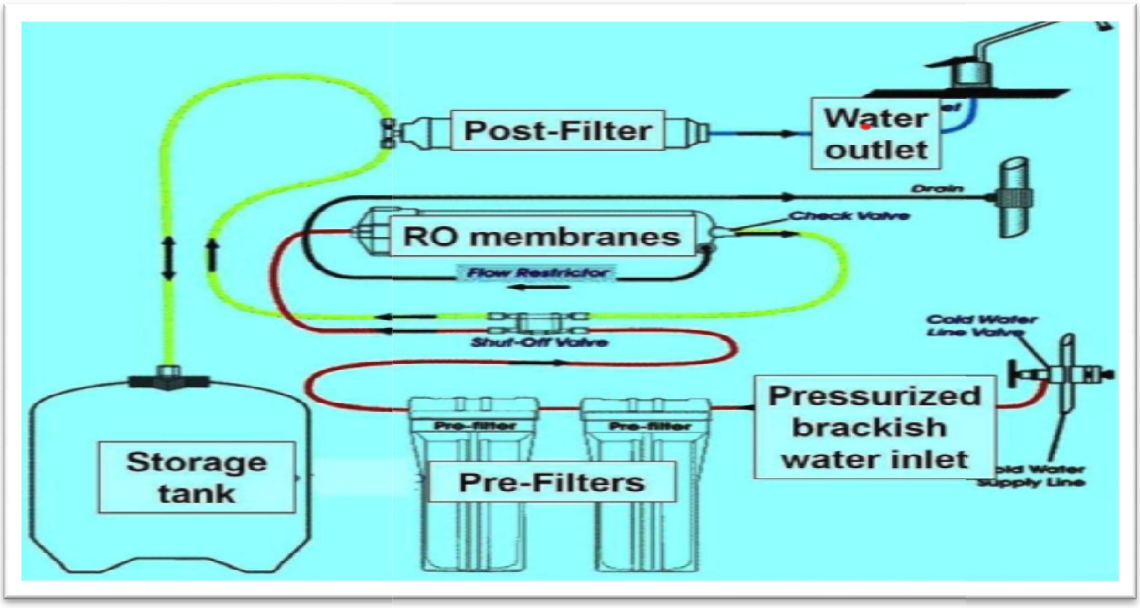

Figure No 2:- Schematic Representation Of Ro Systems[1]

Since only around 2.5 percent of the water on earth is appropriate for direct human use and consumption, clean water is a precious and stressed resource. Presently, there exists a significant disparity between the demand and supply of clean water, with about 25% of the world's population experiencing a financial scarcity of water. Furthermore, current statistical projections indicate that by 2030, nearly 50% of the world's population could potentially be experiencing water stress. Factors including the world's population growth on an exponential scale, ongoing industrialization, rising agricultural production, water pollution, inadequate water management, and climate change all contribute to the problem of water scarcity An enormous amount of work is being done to create and improve alternative water production technologies in an attempt to address the worldwide problem of water scarcity. Furthermore, scientists and policymakers are working hard to raise public understanding of the significance of water management and conservation.

1. The background in theory:- humanity has long been aware of the physical process of osmosis Simply put, osmosis is the spontaneous movement of water molecules over a semipermeable membrane from a solution with low solute concentration (low osmotic pressure) to one with high solute concentration (high osmotic pressure) (fig. 1a). Because the membrane is semipermeable, only water molecules are allowed to flow through while the solutes are rejected. The membrane causes the chemical potentials to equalize (fig. 1b). Applying external pressure to the solution with a higher concentration (feed solution) can halt or reverse the movement of water molecules.Water molecules are compelled to flow in the opposite direction of the natural osmosis phenomena if the applied pressure difference is larger than the osmotic pressure difference across the membrane. The process that is taking place in this scenario is referred to as ro, and it is shown in fig. 3.

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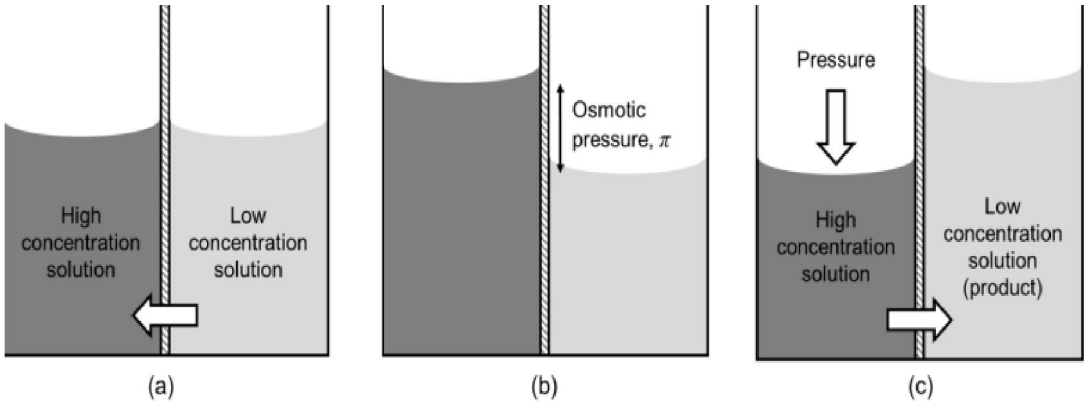

Fig. 3. Schematic of (a) osmosis (b) osmotic equilibrium (c) ro[2]

2 water recovery using reverse osmosis (ro) membranes: the reverse osmosis (ro) system was the first kind of membrane system to be applied to advanced wastewater treatment; these early uses were geographically restricted to locations experiencing water scarcity and were only applicable to groundwater replenishment and water reclamation/reuse (wef 2005). High-quality tertiary effluent can be polished using ro systems to remove soluble ions, dissolved particles, and organic compounds in preparation for reuse or groundwater recharge.

Ro membrane systems are utilized in municipal wastewater treatment facilities to offer advanced post-treatment, enhancing the effluent water's quality for later usage. Reduced salts, disinfection byproducts, and emergent pollutants of concern (epocs) such hormones and prescription drugs are present in the permeate from ro membrane processes (drewes et al. 2002). Consequently, ro membranes will be utilized for post-treatment of municipal wastewater effluent anytime a downstream customer or discharge mechanism needs water of the highest caliber (wef 2005**).**[3]Surface and groundwater supplies provide the world's drinking water. According to drinking water legislation, because it may contain microorganisms, hazardous minerals, metals, organic compounds, pesticides, etc., municipalities must treat and disinfect drinking water before making it available to the general public. Many diseases are brought on by drinking water that has not been adequately treated. The world health organization and the european union set the criteria for drinking water. The rig veda even mentions the significance of minerals and other healthy ingredients in drinking water, describing the qualities of good drinking water as "sheethamic (cold), sushihi (clean), and sivam (should have)."The necessary minerals and nutritional content), istham (transparent), and vimalamlahushadgunam (whose acid-base balance ought to be within normal bounds). Water that had been demineralized, distilled, and then deionized or reverse osmosis treatment was initially utilized in laboratories and other scientific and industrial settings. Due to scarce drinking water supplies in inland and coastal regions, rising drinking water needs brought on by rising living standards, industrial expansion, and more tourism, these technologies were employed increasingly frequently to get drinking water in the 1960s. In regions where seawater or highly mineralized brackish water are the primary water sources, demineralization of the water was also necessary.Demineralized water was also utilized as the only supply of drinking water on board spacecraft and oceangoing vessels. Since these water treatments were expensive at first, only the upper class and middle class in india used them in their houses. However, as economic conditions have improved, ro systems are now a necessary household appliance.[4]

3. Risks to health from consumption of reverse osmosis water: this section discusses the potential negative effects of consuming reverse osmosis water by reviewing some experimental data from studies done on humans and laboratory animals, as well as observations made from populations that were given demineralized water and infants that were given beverages made with distilled water.

4. Intake of calcium and magnesium from low mineral (ro) water is minimal or nonexistent. Magnesium and calcium are vital components for human health. Calcium is a component of teeth and bones. It is also crucial for the myocardial system, blood clotting, heart and muscle contractibility, and other processes. Osteoporosis is the most prevalent condition brought on by a calcium shortage. Hypertension has also been demonstrated to be caused by its absence . Magnesium is necessary for several processes, including muscle contraction, atp metabolism,

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glycolysis, the creation of proteins and nucleic acids, and the passage of elements across membranes, including potassium, sodium, and calcium. Humans who lack it are more likely to develop a variety of pathological disorders, including diabetes, osteoporosis, hypertension, cardiovascular disease, and vasoconstrictions. Long-term consumption of water low in magnesium has been linked to higher rates of morbidity and mortality from cardiovascular diseases, an increased risk of motor neurone disease, problems during pregnancy, etc. Long-term consumption of low-calcium water increases the risk of fracture in children, as well as several neurological illnesses, preterm birth, low birth weight, etc. Certain malignancies can also result from drinking water deficient in calcium and magnesium.

5. Impacts of low-mineral (ro) water directly on the intestinal mucosa:-

according tostudies and reports from the world health organization, drinking demineralized water can lead to an imbalance in electrolytes since the minerals are eliminated through distillation in distilled water or filtration out by a semipermeable membrane in reverse osmosis. As a result, our body's mineral-free water draws electrolytes from our tissues to enable regular bodily functions and waste elimination. A malfunctioning water redistribution process in the body can cause weakness, weariness, cramping in the muscles, headaches, and an irregular heartbeat. Acute health issues have already been linked to mountain climbers who drank water from melted snow without adding the required ions. More serious health issues that might result from this syndrome include metabolic acidosis, seizures, and cerebral oedema.

6. Minimal consumption of micronutrients and vital elements when drinking ro water: generally speaking, some necessary elements are easily absorbed from water rather than food because they are available in natural water as free ions. Reduced mineral content in drinking water has been linked in epidemiological studies to a number of health problems, including anemia, fractures, growth issues, gastric ulcers, goitre, pregnancy troubles, and hypertension. It has been discovered to have a detrimental impact on the process of blood formation and lead to significantly reduced levels of microelements in muscle tissue in laboratory rats. lutai's 1927 study compared two populations residing in areas with varying concentrations of dissolved minerals. The results indicated that the population in the area receiving low-mineral water had a higher incidence of these ailments. Compared to individuals living in areas with water that was moderately mineral-rich, children in this area showed poorer physical development, growth anomalies, and a higher incidence of oedema and anemia in pregnant women.

7. Loss of vital minerals such as calcium and magnesium when food is cooked using low-mineral water:-A significant amount of vital nutrients are lost from food when demineralized water is used for cooking, including over 60% of calcium and magnesium, 70% of manganese, 86% of cobalt, and 66% of copper. Nevertheless, when cooking in natural water, these metal content losses go unreported. Low mineral water used for cooking may remove some nutrients from food, as some nutrients can only be consumed with food. This can leave meals noticeably lacking in these elements.Therefore, any aspect that results in the loss of nutrients and vital elements during food preparation and cooking should be avoided, as the diets we follow today already lack sufficient amounts of many of these elements.

8. Potential rise in hazardous metal consumption through diet: when demineralized water comes into touch with materials, it reacts quite aggressively. As a result, it becomes contaminated because metals and organic materials from pipes, storage tanks, containers, and other plumbing materials dissolve in it easily. Therefore, adding additional dangerous materials to the water after using ro to clean it could be the result. Due to their antitoxic properties, the minerals calcium and magnesium contained in food and water can stop some harmful substances from entering the bloodstream from the intestine.

9. Contamination of low mineral ro water by bacteria: during the reverse osmosis process, bacteria are filtered out by semipermeable membranes because their holes are often larger than those of the membranes. As a result, waste water is drained out, which is subsequently rejected by the system. It is important to note, however, that drinking water systems that use reverse osmosis are not immune to microorganisms.

It's possible that the system has come into contact with some environmental germs. It is possible for bacterial contamination to arise when the system is actually processing water. Defects in the ro membrane may allow germs to pierce it. The ro membrane's seal may occasionally allow bacteria to enter the water. Once inside, the bacteria thrive in low-mineral ro water since there isn't a residual disinfection as there is in natural water and there are plenty of leached nutrients available. The absence of a residual disinfectant in natural water and the increased availability of leached nutrients in aggressive water, especially at high temperatures, promote the growth of bacteria in ro water. Therefore, to

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totally remove bacteria from our water, we should utilize a uv purification system in addition to reverse osmosis. These days, devices that combine reverse osmosis and ultraviolet light are available to ensure that no bacteria get into drinking water.[4]

10. The impact of reverse osmosis (ro) water on expectant mothers is discussed in this article:-A procedure known as reverse osmosis (ro) water purification eliminates pollutants and impurities, including potentially dangerous elements like chemicals and heavy metals. But this procedure also gets rid of important elements like copper and zinc, which are good for you,especially if you're pregnant.

10.1 Zinc's significance during:-Pregnancy: zinc, which is required for numerous biological functions, is the second most abundant trace element in the human body after iron.

10.2 Zinc participates in over 300 enzymatic processes:- And serves as a cofactor in the heme component of hemoglobin production. Its absence can lead to anemia, which during pregnancy puts the mother and fetus at risk.

10.3 Immune system function:- A healthy immune system depends on having enough zinc in the body.deficiency can impair immunological responses and raise the risk of infections, both of which can be dangerous during pregnancy.

10.4 Growth and development:- Zinc aids in the division of cells, promotes wound healing, and aids in the metabolism of carbohydrates. It is especially crucial for the growth of the fetus during pregnancy. Deficiency can lead to poor pregnancy outcomes, cognitive impairment, and development delays.

10.5 risks of copper and zinc deficiencies:-

Because of contamination from industrial processes or natural mineral deposits, zinc and copper are frequently found together in water sources. Cofactor for several iron-metabolizing enzymes, copper is essential for fetal development along with zinc.

10.6 Copper deficiency: Because copper is essential for iron absorption, it can cause anemia or iron-deficiency anemia. Pipes made of galvanized steel: water that travels via these pipes may contain higher levels of zinc and copper, but ro filtration usually eliminates these healthy minerals while drinking ro water can lessen exposure to dangerous pollutants, it may also cause deficiency in vital minerals if the diet is not balanced. Because of the increased dietary demands during pregnancy, this is especially concerning

10.7 Anemia:- pregnant women are more likely to experience , and deficiencies in zinc and copperinrowater may worsen the condition

10.8 Delays in embryonic development:- can be caused by zinc and copper deficiency, which may result in low birth weight and other issues. [5]

11. Techniques for managing operational problems in swro plants when algal blooms occur :-Algal blooms can have a negative impact on swro plants anywhere they are. Thus, it's critical to set up a thorough monitoring program to gauge the possible effects of algal blooms and evaluate how well the pretreatment system works to keep swro from fouling.Algal bloom indicators can be measured routinely, and more frequently during seasons when algal blooms are known to historically occur (see section 5.0). Algal blooms, for example, normally happen in the gulf of oman in the months of january through april and august through september, but they only peak in the arabian sea in the months of august through october. To correctly design the swro plant to function continuously during algal blooms, continuous monitoring must be carried out during the pilot testing phase if historical records are not available. Numerical models combined with satellite optical sensors can be used to track large-scale hab events offshore and predict the movement and landing of these blooms. Although this application is currently undergoing further investigation and validation, it shows promise for creating an swro desalination plant early warning system. While the presence of hab toxins in seawater does not present a significant operational challenge for swro plants, the potential for strong toxins to enter the drinking water system, even at low concentrations, can have a significant negative impact on public health or significantly alter the public's perception of the safety of desalinated water.Drinking water swro plants are advised by boerlage and nada to create a water safety plan (wsp) that identifies the important control point for monitoring algal toxins. The wsp ought to incorporate an ongoing assessment of conductivity, which serves as a salt rejection surrogate, in desalinated water to track the effectiveness of the swro process in eliminating pollutants. An expert workshop on the effects of red tides and habs on desalination operations was held in oman in the wake of the 2008–2009 hab outbreak in the gulf of oman. Daf and uf were strongly suggested as potential gmf substitutes during this session in order to preserve dependable ro plant operation in cases involving severe algal blooms. Furthermore, as a pretreatment option

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for swro, establishing a sub-surface intake (such as beach wells) rather than an open intake is becoming more and more popular. Due to their long retention times, subsurface intakes, particularly vertical beach wells, can act as natural (slow) sand filters that significantly improve the removal of bacteria, algae, and aom from raw water entering swro plants, making them less susceptible to habs.Forswro plants operating with direct/open source intake, extensive pretreatment of the raw water is necessary to maintain or prolong reliable performance and membrane life. However, sub-surface intakes may not be applicable in certain coastal locations where the geology of the area (e.g., high mud content sediments, low permeability rocks) makes it unfeasible to install such structures due to high energy costs.Therefore, in order to guarantee acceptable ro feed water quality and stable operation during algal blooms, primary and secondary pretreatment systems are installed. Primary pretreatment usually consists of microstraining/screening to remove large suspended materials (n50 μm), coagulation, and clarification by sedimentation or daf. Secondary pretreatment usually consists of (dual) gmf or uf. A dependable pretreatment system is one that can consistently produce high-quality ro feed water while maintaining stable hydraulic operation. For gmf and uf pretreatment systems, stable operation is defined as the system's capacity to maintain acceptable backwash frequency at minimum chemical and energy requirements. Gmf may require full-To guarantee stable hydraulic operation and high-quality ro feed water, scale coagulation/flocculation is followed by clarifying. In uf pretreatment systems, a flocculation basin or floc removal phase might not always be necessary. According to schurer et al. [144], in-line coagulation without flocculation or clarifying prior to algal blooms can stabilize ufoperation.Further operational measures, like reducing membrane flux and implementing a forward flush cleaning, may also help uf perform better in severe algal bloom situations. However, these actions translate into a larger required filtration area (larger overall footprint) and lower uf membrane productivity. Intermittent coating, intermittent coagulation, and pre-coating uf membranes with a layer of pre-formed flocs of ferric hydroxide at the beginning of each filtration cycle have all shown promise in controlling uf hydraulic performance during algal bloom periods with low chemical requirements.Combining these dosing strategies with the new generation of uf membranes with low molecular weight cut-off may guarantee the production of high-quality ro feed water with very little coagulant consumption.[6]

12. Analysis of fluoride content

All the samples were analyzed at the maharashtra public health engineering department, district laboratory, dhule. Fluoride concentrations in all the samples were tested using a standard method given by the american public health association employing fluoride ion selective electrode.solutions with 0.1–10 ppm of fluoride were used to standardize it. Equal volumes (20 ml) of each water sample and the total ionic strength adjustment buffer solution were mixed in a plastic beaker for the fluoride analysis, and the mixture was swirled to get rid of any air bubbles. Prior to obtaining readings for every sample, the electrode was cleaned, pat dried, and then inserted into the test solution. The solution was agitated well with the electrode, and the consistent readings on the meter were documented. Every 30 minutes, the instrument's calibration was done. Analytical statistics the statistical package for the social sciences (spss, ibm corporation, armonk, ny, usa) version 16 software was used to statistically analyze the values that were collected. Descriptive statistics were used to report the mean fluoride concentration before and after filtration as well as the mean difference in fluoride concentration. The mann-whitney u test was used to compare the mean difference in the fluoride removal capacity of filters with and without total dissolved solid (tds) controller. It was deemed statistically significant when $p<0.05$.

13. Results

For every test group, the mean fluoride concentration before and after ro filtration, the mean difference in fluoride concentration, and the percentage reduction were found. Prior to ro filtration, the baseline water fluoride levels ranged from 0.53 to 0.54 parts per million. After going through various ro filters, all of the water samples in the current investigation displayed a decrease in fluoride level in the range of 0.270–0.457 ppm [table 1]. Additionally, the mean difference in fluoride removal between ro filters with and without tds controllers was examined. For ro filters with and without a tds controller, the mean difference in fluoride removal was determined to be 0.41 and 0.36 ppm, respectively. This difference was not statistically significant ($p = 0.286$).

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Table 1: Concentration of fluoride in drinking water before and after filtration

RO filters (filtration technology)	Mean±SD fluoride concentration (ppm)		Mean reduction (ppm) (percentage reduction)
	Before filtration	After filtration	
Filter 1 (RO + UV + UF + TDS controller)	0.543±0.01	0.163±0.01	0.380 (69.98)
Filter 2 (RO + UV + TDS controller)	0.540±0.01	0.193±0.01	0.347 (64.25)
Filter 3 (RO + UV + UF + TDS controller)	0.540±0.01	0.083±0.01	0.457 (84.62)
Filter 4 (RO + UV + TDS controller)	0.540±0.01	0.106±0.01	0.434 (80.37)
Filter 5 (RO)	0.536±0.01	0.143±0.01	0.393 (73.32)
Filter 6 (RO)	0.536±0.01	0.266±0.01	0.270 (50.37)
Filter 7 (RO + UV + UF + taste enhancer)	0.536±0.01	0.133±0.01	0.403 (75.18)
Filter 8 (RO)	0.540±0.01	0.236±0.01	0.304 (56.29)
Filter 9 (RO + UV)	0.543±0.01	0.186±0.01	0.357 (65.74)
Filter 10 (RO)	0.536±0.01	0.130±0.01	0.406 (75.74)

UV – Ultraviolet, UF – Ultrafiltration, TDS – Total dissolved solids, SD – Standard deviation, RO – Reverse osmosis 7

14. Disease caused due deficiency of calcium :- calcium, an ample mineral in human bodies, plays pivotal roles in various biological processes, encompassing both physiological and pathological aspects

Severe symptoms of hypocalcemia include:

Confusion or memory loss, muscle spasms,numbness and tingling in the hands, feet, and face depression, hallucinations, muscle cramps,weak and brittle nails,easy fracturing of the bones

Calcium deficiencies can affect all parts of the body, resulting in weak nails, slower hair growth, and fragile, thin skin.

13. The Summary Of Calcium Intake And Cardiovascular Disease:-

It has been shown that drinking distilled or low mineral content (TDS < 50 mg/L) water has a detrimental impact on taste qualities, to which the user may eventually adjust. Additionally, this water was said to quench thirst less effectively. These should be addressed when evaluating whether low mineral content water is suitable for human consumption, even if they are not thought to be health impacts One of the essential minerals in drinking water is calcium. It plays a significant part in bone metabolism and makes up a sizable portion of bones and teeth. It also affects intracellular information transmission, heart and muscle contractility, the appropriate operation of the conducting myocardial system, neuromuscular excitability (i.e., its reduction), and blood coagulability. of high blood pressure . However, there was no evidence linking the incidence of kidney stones to excessive calcium intake. The development of kidney stones was more influenced by whether calcium was taken with or without food. By binding oxalic acid, a precursor to typical kidney stones, in food and decreasing its absorption, calcium that reaches the lower small intestine actually prevents kidney stones. The same would apply to calcium consumed by food and drink. A higher risk of kidney stones was instead linked to calcium supplements, either because the supplements were taken by people who took more than the recommended daily intake of 2500 mg of calcium or because the calcium was not consumed with food.Confirmed that calcium consumption from dairy foods was associated with a decreased risk as opposed to external calcium supplementation. Fascinatingly, the relationship between calcium consumption and the chance of crc appeared to be independent of the source of intake.[8]

14. Osteoporosis

Osteoporosis is a complex disorder of multifactorial origin that is characterized by an asymptomatic reduction in the quantity of bone mass per unit volume when bone mass becomes too low, structural integrity and mechanical support are not maintained , and fractures occur with minimal trauma. The most common sites of osteoporotic fracture are the proximal femur, distal radius, vertebra , humerus, pelvis, and ribs. In clinical research , such a diagnosis is frequently applied only to patients with one or more fractures even though it may be detected in many patients by measuringbone mass with single or dual photon absorptiometry (spa or dp a) or using qct, or quantitative computer tomography . The elderly and postmenopausal white women are most likely to develop osteoporosis by the age of 65, about 20% of women experience osteoporotic fractures, and by the age of 90, over 30% have fractures men and black women do not exhibit significant osteoporosis until after the age of 60, at which point fracture rates gradually rise.[9]

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15. Deficiency of sodium effect on human body:-Hyponatremia signs and symptoms may include:-Nausea and vomiting,headache,confusion,loss of energy, drowsiness and fatigue, restlessness and irritability,muscle weakness, spasms or cramps,seizures,coma.The glomerular filtration rate and blood pressure, two mechanisms that control the balance of sodium and water, have a major impact on the movement of sodium and water inside the renal tubule. Unwanted outcomes are linked to an imbalance. Gitelman syndrome (gs) and barttersyndrome (bs) are two conditions linked to sodium shortage.Gitelman syndrome, an autosomal recessive tubular illness, is brought on by biallelic mutations in a gene that codes for a sodium-chloride co-transporter proteintransporter. They account for between 7and 10% of the electrolyte tubular absorption. Hypermagnesiuria, or increased excretion of magnesium, and hypocalciuria, or decreased excretion of calcium, are the hallmarks of gs. Moreover, hypokalemic alkalosis, or an imbalance in the acid-base system and salt loss, is a condition seen in gs patients. Additional symptoms of the disease include low blood pressure, cramps, exhaustion, and muscle weakness brought on by an electrolyte imbalance brought on by different mutations in the slc12a3 expressing gene.every person eventually experiences the accelerating biological aging process. Connected to reactive oxygen species, aging, and oxidative stress. Patients with gs/bs have decreased levels of oxidative stress and ros, as well as down-regulation of pathways linked to inflammation. In this environment, sirt1 activity is sustained at higher levels in gs and bs patients compared to healthy individuals, and this appears to have a substantial effect on hypertension and the aging process. We draw attention to the significance of the renin-angiotensin-aldosterone system and the markers of aging in patients with gitelman syndrome, and how these factors may affect healthy aging.

16. Syndrome gitelman:-In the late 1960s, nephrologist hilleljonathangitelman began to see patients with a range of ailments linked to electrolyte imbalance, metabolic alkalosis, and salt wasting.Familialhypokalemia-hypomagnesemia, or gitelman syndrome (gs) (omim 263800), is one of the most prevalent renal tubulopathies. It is a hereditary condition that runs in families and is caused by a disruption in the kidney's thiazide-sensitive sodium chloride co-transporter (ncc) function. During this process, there is a magnesium and potassium shortage in the blood, yet there is a high excretion of magnesium and a decreased excretion of calcium in the urine. Metabolic alkalosis, hypomagnesemia, and hypercalciuria are the hallmarks of gs. The distal convoluted tubule (dct) transport deficiency is the cause. It is thought to affect 1 in 40.000 caucasian people and appears in adolescence or adulthood .It is expected to affect about 1.7 out of every 1000 people and is more common among the asianpopulation.Becausegs is so subtle or frequently misdiagnosed, it is challenging to pinpoint the true prevalence of the condition in the general population. The thiazide-sensitive sodium chloride co-transporter-ncc is encoded by the slc12a3 encoding gene, which is the source of the disease's biallelic inactivating mutations. Its 26 exons encode 1002 amino acids at the chromosome 16q13 genomic region cells in the apical membrane bordering the distal convoluted tubule express ncc .In gs patients, studies have found over 350 different mutations in the slc12a3 encoding gene.furthermore, mutations in the protein claudin 16 gene (trpm6) cation channels subfamily 6 are implicated in the transport of magnesium in distal tubules. Sixty-two percent of slc12a3's mutations are nonsense and missense variants. A missense mutation occurs when one base pair is spelled incorrectly, resulting in the creation of a different amino acid. A stop codon is produced and protein synthesis is stopped if the mutation is meaningless (nonsense mutation). Additionally, there are little deletions at about 12% and splicing mutations at about 13.5%. Lastly, there are 5% of little insertions and significant deletions. 7,4% take into consideration further mutations.[10]

16. Magnesium deficiency effect on body:- magnesium and bonesour teeth and bones contain between 60 and 65 percent of magnesium, with the remaining portion found in other body parts like muscles and bodily fluids. Outstanding bone surgeon dr. Barnett revealed in a research paper at the 1952 annual texas medical association meeting in dallas that individuals in deaf smith county, Compared to dallas county citizens, texas had a reduced rate of dental decay and faster bone healing. It was found that deaf smith county inhabitants had five times higher magnesium levels than dallas county residents. Dr. Barnett also noted that deaf smith county residents ate a diet high in protein, magnesium, and vitamin c.

17. Magnesium and energy:-this nearly overlooked but vital mineral is essential to the human body's ability to turn food into energy and maintain healthy bodily functions (raloff, 1997). Adenosine triphosphate, or atp, is a crucial molecule for the body's energy storage and is activated by magnesium. In other words, there wouldn't be any movement or life without magnesium. Dr. Carolyn dean (2007) claims that magnesium aids in the body's synthesis and movement

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of energy. It also facilitates the relaxation of muscles and the transmission of nerve messages. Individuals with low magnesium levels become fatigued easily and require more oxygen and energymagnesium aids in muscle contraction and is necessary for the metabolism of energy .[11]

7. Magnesium and the heart:-

Studies show that magnesium contributes to blood pressure and blood sugar regulation. According to rude (1998) and vormann (2003), magnesium helps control and prevent hypertension and cardiovascular disease. These two trials show that symptoms of anxiety, palpitations, poor energy, fainting, and breathing issues were significantly reduced in patients who took magnesium for around five weeks. According to a different study, individuals with high blood pressure who consumed 625 mg of magnesium per day experienced a decrease in hypertension (montoyama, 1989).according to a double-blind, placebo-controlled trial, people who consumed 411 to 548 mg of magnesium daily saw a significant improvement in both their systolic and diastolic blood pressure (itoh, 1997). Prominent magnesium researchers indicated that between 70 and 80 percent of their subjects had low blood-ionized magnesium levels and borderline hypertension (altura, 1995). In a related study, magnesium shortage was discovered in almost 60% of 141 patients with severe symptoms of mitral valve prolapse, compared to 5% in the control group**.**

8. Magnesium and electrolyte :-

For the body to maintain its electrical equilibrium, magnesium is essential. It also aids in controlling the cells' metabolism. The brain's nerve cells become irritated by too much calcium without enough magnesium, which causes repetitive electrical impulses to be delivered. Cell death and energy loss result from this. Magnesium is the most crucial mineral for cellular function, claims mark sircus (2007). Additionally, it preserves and harmonizes the body's electrical signals.

9. Magnesium and diabetes:-according to research, magnesium controls blood sugar levels and keeps them from rising uncontrolled. Research on three groups—85,000 women in harvard'snurses health study, 43,000 men in its health professionals follow-up study, and 40,000 women in the iowa women's health study—found that consuming enough magnesium in food—between 300 and 400 mg daily, depending on body weight—reduces the risk of type 2 diabetes. Because a significant amount of magnesium was lost in the urine, individuals in these studies who consumed less magnesium displayed diabetes-related symptoms (altura, because magnesium promotes increased glucose metabolism in the body, it may even be able to address the issues associated with obesity and diabetes.[12]

10 Potassium deffiecincy effect on human body :-

1. **Muscle weakness and cramps :-** potassium is essential for nerve signal transmission and muscle contraction. These processes can be hampered by a deficit, which can result in muscle weakness, cramps, spasms, or in extreme situations, paralysis**.**

2. Fatigue and weakness:-General weariness and physical weakness are brought on by low potassium levels, which interfere with organ and cell function. Potassium is necessary for both cellular function and energy production, so a shortage lowers energy levels overall.

3. Heart palpitations and arrhythmias:-Potassium affects the heart's electrical impulses, which helps control heart rhythm. Palpitations, irregular heartbeats (arrhythmias), and, in extreme situations, an increased risk of sudden cardiac arrest are all symptoms of hypokalemia**.**

4. Digestive issues:-Potassium is also necessary for the proper operation of the digestive tract's muscles. Deficit can lead to reduced bowel movements, which can cause bloating, constipation, and in extreme cases, intestinal paralysis (paralytic ileus).

5. High blood pressure:-Normal blood pressure requires a balance between sodium and potassium levels, which potassium helps to provide. Increased sodium retention brought on by low potassium levels can raise blood pressure and exacerbate hypertension.

6. Numbness or tingling:-Low potassium levels can affect nerve function, frequently in the extremities, causing numbness, tingling, or "pins and needles" feelings.

7. Mood changes:-potassium affects mood control via influencing neurotransmitter activation. Because low levels of potassium can cause neurotransmitter dysfunction, mood swings, irritability, and even depression may be exacerbated.

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8. Kidney problems:-Maintaining fluid and electrolyte balance is aided by potassium. A shortage can have a detrimental effect on kidney function, raising the possibility of kidney stones and reducing the kidneys' capacity to concentrate urine.[13]

11.Differece between ro water and ground water:-

Ground water	Reverse osmosis water ro
1] comes from natural underground sources like aquifers. It's accessed via wells or springs.	1] produced by filtering tap water or groundwater through a reverse osmosis system to remove contaminants and impurities
2] may contain minerals (calcium, magnesium), bacteria, or pollutants, depending on the location and depth.	2] significantly purer, as reverse osmosis filters out most dissolved solids, bacteria, heavy metals, and other contaminants.
3] provides essential minerals that are beneficial to health.	3] may need mineral supplementation if consumed exclusively, as the filtration process strips beneficial minerals.
4] has a natural taste due to its mineral content.	4] tends to have a flat or neutral taste because the minerals that enhance flavor are removed.
5] can be prone to contamination from agricultural runoff, industrial pollutants, or naturally occurring substances like arsenic.	5] safer for drinking since the filtration process removes most contaminants, including bacteria, viruses, and chemicals.

II. CONCLUSION

Health impact:-Ro water is purified by removing contaminants, including minerals, heavy metals, and microorganisms. This can be beneficial in areas where water sources are polluted. However, the process also removes essential minerals like calcium, magnesium, and potassium, which are beneficial for health.Possible mineral deficiency: long-term consumption of demineralized water could contribute to mineral deficiencies, potentially affecting bone health, cardiovascular function, and metabolic processes. It is advisable to supplement mineral intake through diet or fortified water to mitigate this risk.Potential mineral deficiency: ro water removes not only harmful contaminants but also essential minerals like calcium, magnesium, and potassium. Prolonged consumption of demineralized water may lead to deficiencies in these vital nutrients, potentially impacting bone health, cardiovascular function, and overall well-being.Health implications: mineral deficiency can increase the risk of conditions such as osteoporosis, muscle cramps, fatigue, and irregular heart rhythms. Individuals with diets already low in minerals may be more susceptible to these effects.

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