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WASH behavior: Indigenous method for Water Purification in rural India

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Abstract

Poor quality of water and lack of sanitation facilities unequally affect women, girls and the children. It is found out by the research that 70% of India's water is contaminated and 2, 00,000 people die in India from polluted water every year. Every year more than 3.4 million people die as a result of water-related diseases, More than 30% of marginalized women are violently assaulted every year as the lack of basic sanitation forces them to travel long distances to meet their needs in the rural India.

The main sources of drinking water for many villages in India are unprotected ponds or tanks, wells, and sometimes streams and rivers which are frequented daily for collecting drinking and cooking water, washing clothes, bathing, livestock washing, etc which has an adverse impact on the health of the poor people living in drought villages.

More concentration of arsenic and fluoride in the water due to fertilisers, pesticides and other industrial waste ,the level of chemicals mixed in the water become so high, that bacterial contamination becoming the main source of water-borne diseases such as diarrhoea, cholera and typhoid. The World Bank report estimates that 21% of the communicable diseases in India are purely due to unsafe water.

The steps taken by the government is not enough to treat the polluted water into drinkable water. The lack of sufficient infrastructure, services and adequate financial support waste water treatment facilities further exacerbates the water problem. In the absence of proper treatment technologies with the government, taking into account the severity of the diseases and number of deaths occurred year after year due to drinking polluted water. The only option for both the government and the public is finding and promoting an alternative technology which is people friendly, locally available, technically feasible ensuring practicality is the indigenous technology. At the same time, it should yield good result in improving the microbiological quality of water which drastically reduces the waterborne diseases. This paper focuses on the contemporary traditional practices like seeds, roots, skins, woods being followed by the rural people in different parts of Tamil Nadu for treating the polluted water into to portable water thereby ascertaining the health of not only the women and children, but the society at large as well

Keywords: Water - contamination- indigenous- rural – women and children

1. Introduction

As nearing summer, the scenes of women in group, running behind the water tank lorry with plastic pot or buckets and struggling with the neighbours and relatives with wordily quarrel sometimes exchange of beatings involving elbowing, pushing and punching with vessels between women between

men finally, returning back with meagre water or empty pot would be a routine in any city or many cities in India.

Many a time the tiny start of fight converted to violent attack, the next day newspaper would carry a news item with photo of a diseased lying in pool of blood in their own street with caption that person was killed in water conflict. To one's surprise, the NCRB, the National Crime Report Bureau reports that there are 232 Indians killed in water conflicts between 2017 and 2019. It was also stated that more than 2,000 cases related to water conflicts have been registered.

But according to the activists working on the water issues said that the data given by the NCRB is not the exact one but it is just a tip of the iceberg. Unregistered cases and the number of cases got compromised between two parties outside the police station was manifold. Government report says that this is more in the areas which are notorious for occurrence of droughts leading to acute water scarcity every year. Women and children are the direct and indirect victims of the death of either of the parents. Further the national Remote sensing Centre reports that India is going through an unprecedented serious water crisis.

2. Deteriorating water level in India

A report published by the National Remote Sensing Centre in 2019 had concluded that the country is going through a serious water crisis. The report titled 'Reassessment of Water Availability of Water Basin in India Using Space Inputs' stated that over-exploitation of groundwater is a cause of concern. As per the report, on an average, the groundwater level is decreasing by 40 centimetres every year across the country.

Contaminated water

On many occasions the water fetched from the only source of water, the open ponds and wells lakes is dirty, brownish colour not completely drinkable. The country's groundwater was now heavily contaminated with chemicals linked to cancer. There are many diseases spread from the contaminated water i.e., Malaria, Typhoid, Cholera Giardiasis, Hepatitis A, Amoebiasis, Ascariasis, and Hookworm.

Government alone cannot solve it

The meticulous planning and long term vision of the government to provide purified water and to battle the water crisis inadequate and far from real needs. The only option in the hands of rural Indian is the revival, promotion and expansion of the indigenous strategies that were being followed by the people in rural India.

Area more affected

The areas particularly that have arsenic contamination, fluoride contamination, with salinity, with nitrates the drinking problems is more worsen.

As long as the level of arsenic and fluoride in the groundwater is within the limit there is no negative impacts, but when it became more concentrated due to nitrates mixed in the fertilisers, pesticides and other industrial waste that has seeped into the supply. The severity of the problem will be more when the level of chemicals in the water become so high, that bacterial contamination – the source of water-borne diseases such as diarrhoea, cholera and typhoid which is the second line of problems.

Here in the next paragraphs an attempt is made to give the details of the strategies locally sourced low-cost water treatment materials and techniques for bacterial and particle removal in poverty stricken communities". Practiced in the global level and in India particular in Tamil Nadu

3. Review of literature

Dhanasekaran et. all (2017) in his study revealed that thousands of tribal living in many areas in Maharashtra and Andhra are forced to drink contaminated water day in a day out. This has further ended in the death of hundreds of the innocent tribal just for the water-borne diseases.

WHO (2017) : The World Health Organization says that every year more than 3.4 million people die as a result of water related diseases, making it the leading cause of disease and death around the world. People with low resistance, mainly elderly people and young children, are vulnerable to these diseases. Annually about 37.7 million Indians are affected by waterborne diseases, 1.5 million children die of diarrhoea and 73 million working days are lost. Currently, only 70 per cent of India's states treat less than half of their wastewater.

What is pH

The pH value of purified water is seven, as the concentration of hydrogen and hydroxide ions is equal, making it neutral. Purification systems have alkaline filters which can neutralize the acidity in water to bring the pH value to seven.

Full form of pH is potential of hydrogen, since pH is effectively a measure of the concentration of hydrogen ions (that is, protons) in a substance. The pH scale was devised in 1923 by Danish biochemist Søren Peter Lauritz Sørensen (1868-1969).

What is pure Water

Pure water is called distilled water or deionized water. It is said that as water evaporates, it distils, or leaves the salt left behind. The pure water evaporated is collected and condensed to create a new form which is called distilled water.

Carbon, ceramic, and sand are some of the most efficient water filtration natural materials systems to protect water against these deleterious effects.

4. Historical methods of water purification

The ancient Greeks method

It is not that the Indian alone follow different traditional methods for purifying the water. Many ancient cultures had used copper, iron or hot sand in conjunction with boiling it to disinfect water for drinking purpose. It was found out that in Greece, the ancient people used a fabric bag, called the Hippocrates Sleeve, to remove the strain in the water before boiling it.

Indian method

There is an evident that in ancient India, people used sand and gravel filter the contaminated water before boiling it.

The ancient Egyptians method

Historical method followed among the Egyptians was that they used some traditional Plants such as water lily roots and the seeds of the Nirmali (*Strychnos potatorum*) to purify the water particularly the dusty water. It was also identified that in ancient Egypt, the people used an aluminium sulphate, iron sulphate, or a mix of any two to remove suspended solids in the water.

The common methods used for purifying water in India are:

1. Boiling
2. Filtration

3. Sedimentation
4. Household slow sand filter
5. Domestic chlorination.
6. Storage and sedimentation
7. Up-flow roughing filter
8. Slow sand filtration
9. Chlorination in piped water-supply systems.
10. Long storage
11. Solar radiation
12. Through a piece of fine, clean, cotton cloth to remove some of the suspended solids.

Here are the common traditional but effective methods being followed by the rural people in India in general and Tamil Nadu very particular.

Drumstick tree seeds (Moringa seeds)

The Drumstick tree seeds Tree is also used as a water purifier water as it is a low-cost water purification technique which helps drastically reduce the incidence of waterborne disease in the countries like India one of the developing countries. According to it the procedure is that people use only seeds from the *Moringa oleifera* tree, which can produce a 90.00% to 99.99% bacterial reduction in untreated polluted water. *Moringa oleifera* plant, a tree native to India helps effectively purify water at a low cost, say scientists.

5. Practical Method of Purification

- To begin with, collect the water from the source of water by it pool, tank or lake or open well to some container like pot. Vessel and buckets as much as needed for drinking purpose.
- Take the ripped drumstick and just peel the seeds of it according to the amount of water to be treated. It is always advisable that one seed is for one litre ratio.
- Having taken out five to six seeds then sashed the seeds until it becomes smooth.
- The fourth step is mixing of crushed *Moringa* seeds in a container that contains water turbid as already mentioned ratio that is one seed for 1 litre.
- The important step in the process of improving the contaminated water to the drinkable water is just stirring the water in the container at a speed of 55-60 revolutions per minute and slowly then do the same stirring gently for 5 minutes.
- It can be seen that there is a sedimentation at the bottom of the container. Precipitated water for 1- 2 hours or more, followed by just separate the clean water from sediment slowly one gets a pure water which could be used for drinking.
- The final product of this purified water can be used for all purposes like wash, take a bath and also for drinking.

Many studies proved that the *Moringa oleifera* leads to modest reductions in blood sugar and cholesterol. But it is found out that the seed have antioxidant and anti-inflammatory effects and it effectively protects against arsenic toxicity.

Orange peels

Orange peels can also be used to clean wastewater clean wastewater by filtering out heavy metals and organic pollutants. It was identified by the University of Granada, scientists from the Spanish college, together with Mexican researchers, ay to turn leftover pieces of citrus peels from oranges and grapefruits into a new absorbent material which is capable of doing the work of converting the quality of water.

“F” Sand and Plant materials

Some researchers from Carnegie Mellon University in United States of America earlier used sand and plant materials to create a low cost and effective method for water filtration medium, which they termed "f-sand. The method of creation of F-sand was that it was first extraction of the seed proteins from the *Moringa oleifera* plant, followed by adhering them to the surface of silica particles, then the principal component of sand is ready. This "F sand kills microorganisms and reduces turbidity, adhering to particulate and organic matter. With this method the undesirable contaminants in the water can be washed out, keeping the water clean for longer duration. F sand can be reused. The *Moringa oleifera* plant tree grows in tropical and subtropical climates well.

Lemon peel purify water

Method of preparation

- First, boil the saved vegetable or fruit peels for minimum thirty minutes and pat dry
- Then grind the peels using a mortar and pestle, or any other grounding method you are familiar with.
- The third step is using a strainer and submerge the ground peels into water and let sit through out night
- Lastly, you just remove the strainer from the water. You get the purified water for drinking.

Tulsi leaves also used to purify water

It has been found that a handful of Tulsi leaves can decontaminate about 20 litres of water.

The solar water

It is one of the disinfection methods (SODIS). It is also a simple procedure to disinfect drinking water. The main process is that during this time, the UV-radiation of the sun kills the pathogens in the contaminated water.

The fruit peels purify water

Some fruit peels also are also used for purifying the contaminated water. But soak small segments of peel in a rubbing alcohol solution. In this method it dries them out, and put them in dirty groundwater for minimum two hours and they adsorb heavy metal ions, dyes, pesticides, and nanoparticles like even the gold and silver. Then remove the peels. Now the drinking water is ready.

The natural purification of water

By nature there is a purification method. Normally surface water contains inorganic and organic compounds as suspended matter and dissolved substances.

In order to convert the natural water into drinking water, the contaminations in water needs to be destroyed completely by following purifying methods as maximum as possible one can to ensure the quality to the extent human drinks.

Some herbs purify water

Apart from seeds and natural process it is found out that the cilantro absorbs metals, providing cleaner drinking water. The method is as simple as that. Firstly, the dried cilantro is placed into tea bags that and the bag is placed in a pitcher of water for two to five minutes by the time five minutes is over the bag would have sucked out the heavy metals mixed in the contaminated water.

The main positive aspect of using *Moringa* seeds in the contaminated water for purification process is that the dissolved organic matter, left over in the water will contribute to growth of any pathogens that may come into contact with the treated water.

Floating Plants purify water

There are certain floating plants which also contribute to the purification of contaminated water. To quote, the Water lilies (*Nymphaea* spp.) and water poppies (*Hydrocleys nymphoides*) which are commonly used for purification of contaminated water. These plants do it by absorbing nutrients mixed in the water.

Herbal leaves purifies water

Yes. The dried and extracted herbal leaves like Tulsi, Neem, and Wheatgrass are used for purifying water. In addition to purifying water it also has some medicinal values.

Goose berry wood

A piece of goose berry wood from the tree is also used in rural areas for purifying the water collected from the open source of water. In this method, a piece of wood cut from the goose berry tree is put into the water container and let it get soaked for thirty minutes. The waste materials and chemicals are observed by the wood. The remaining water become a drinkable water. It also adds smell and taste of the water.

Thetran Kottai purifies -Muddy water

The seeds of the *Strychnos potatorum* tree (Thetran Kottai in Tamil), also otherwise called the clearing nut tree which are mainly used to remove sediment or turbidity from normal water thereby producing a drinkable water.

6. Method of purifying water with Thetran Kottai

First, take only one dried seed of Thetran Kottai then you just rub this seed on a hard stone mixing with few drops of water, as rubbing is, a tooth paste like jell will come. Then mix this paste with some water. When the process is going on you can see the settling down majority of the dust particles and reduces which are responsible for hardness of the water.

These seeds of the trees are very largely used in some parts of India for clearing muddy water particularly in some districts of Tamil Nadu.

When you rub this seed on a hard stone with few drops of water, you will get paste. This paste has to be mixed in the water. This will help in settling down majority of the dust particles and reduces hardness of the water. The seeds of the tree are commonly used for purifying water.

7. Importance of Thetran Kottai

- It is practically proved that two Thetran Kottai is sufficient to purify 10 litres of water within two hours' time. It also serves as a medicine to put weight to the puny persons.
- Goldsmith use this Kottai to remove the dust deposited in the old gold ornaments by rubbing the seeds till bubbles come out.
- Water collected from the open tank will be purified within five to ten minutes if the seed is rubbed within the pot.

This is a short tree widely grown in mountains and in some plain areas of Tamil Nadu. This method is still use in some specific districts including Tanjore, Sivaganga and Ramanathapuram where the main source of drinking water in open pools and lakes.

8. Conclusion

Women and children are the ultimate sufferers and victims of drinking contaminated water in the rural and tribal areas. It is needless to say that the very survival of human being is totally depend on natural water. Taking into account the ever growing population on the one hand and depletion of ground water level every year on the other, provision of pure water by the government to its entire population is practically not possible and unimaginable. As most of the population live in rural areas with poor economic status.

The technological advancement for water purification available in the open market is accessible and affordable only to the rich people in the cities. With increasing chemical application in the agriculture farming and mixing of chemical wastes from the industries located on the bank of rivers in the running water from where water is pumped for villages further aggravated the drinking water problems. No laws or Act can purify the contaminated water it is only the people who have to be aware and take immediate steps to produce pure water from the polluted water by adopting the locally available traditionally followed methods so as to save the health and life of women and children for which government should also focus on the encouragement the people to widely use these low cost and people friendly methods till every citizen is assured of pure water from the government schemes which seems to be a long way to go.

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