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Research Article

DRINKING WATER SAFETY SURVEY AMONG PHYSICIANS OF INDIA

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ABSTRACT

Aim and Objective: Drinking Water Safety Survey of Doctors was conducted with the aims of understanding healthcare professionals' opinion, attitude, perception and knowledge regarding various water purification processes and technologies and understanding the compliances against recommendation among their patients.

Background: Around 37.7 million people are affected by waterborne diseases annually (viral hepatitis, cholera, jaundice, typhoid are examples) while 1.5 million children die from diarrhea alone every year.

Methodology: Hard copy (paper-based) versions of the survey instruments were used to survey a randomly selected sample population within a national geographical location. Printed questionnaires were sent/given to the sample by the Women HO. All responses were captured electronically and stored securely at Women HO head office at New Delhi.

Questionnaire Design: Questionnaires for doctors were based on draft versions developed by the Project Advisory Group, with input from experts in public health epidemiology. The questionnaire contained questions about doctors role in prevention of WBD (Water Borne Diseases), factors causing WBD, awareness among masses about importance of safe drinking water, doctors opinion about boiling of water and RO purification and patients compliances etc.

Conclusion: Doctors can play a major role in controlling water borne diseases and Patients are aware about the importance of safe drinking water but they are not complying it well. Doctors opine that RO treated water is safer than boiled water. Doctors believe that RO treated water can reduce the incidence of water borne diseases effectively.

Keywords: Drinking Water, Physicians of India, Purification, Reverse Osmosis (RO) Treated Water, Women Health Organization

INTRODUCTION

Drinking water safety survey among physicians of India was carried out by Women Health Organization. Women Health Organization (Women HO) is dedicated to the improvement and advancement of women's health in all stages of life. Women Health Organization works to promote healthy and quality of life for women starting from infancy to old age. In partnership with government, NGOs, public sector and private sector, Women Health Organization promotes women's health through education, advocacy program and campaign implementation.

Most of us we don't think about the drinking water. Our body weight is more than 50% of water. Without water, we couldn't maintain a normal body temperature, lubricate our joints, or get rid of waste through urination, sweat, and bowel movements. Not getting enough water can lead to dehydration, which can cause muscle weakness and cramping, a lack of

coordination, and an increased risk of heat exhaustion and heat stroke. In fact, water is so important that a person couldn't last more than five days without it¹⁻³.

We need to stay hydrated that is clear but is the tap water in our home safe? It is considered generally safe if it comes from a public water system, such as one run and maintained by a municipality.

Water can be contaminated in several ways. It can contain microorganisms like bacteria and parasites that get in the water from human or animal fecal matter. It can contain chemicals from industrial waste or from spraying crops. Nitrates used in fertilizers can enter the water with runoff from the land. Various minerals such as lead or mercury can enter the water supply, sometimes from natural deposits underground, or more often from improper disposal.

Does boiling contaminated water make it safe to drink? It depends on the contaminant. Boiling water can kill germs, but things like lead, nitrates, and pesticides aren't affected. And

since boiling reduces the volume of water, it increases the concentration of those contaminants⁴⁻⁸.

Drinking water purification

Around the world, household drinking water purification systems, including a reverse osmosis step, are commonly used for improving water for drinking and cooking.

Such systems typically include a number of steps:

- A sediment filter to trap particles, including rust and calcium carbonate
- Optionally, a second sediment filter with smaller pores
- An activated carbon filter to trap organic chemicals and chlorine, which will attack and degrade thin film composite membrane reverse osmosis membranes
- A reverse osmosis filter, which is a thin film composite membrane
- Optionally, a second carbon filter to capture those chemicals not removed by the reverse osmosis membrane
- Optionally an ultraviolet lamp for sterilizing any microbes that may escape filtering by the reverse osmosis membrane
- Latest developments in the sphere include nano materials and membranes

In some systems, the carbon prefilter is omitted, and cellulose triacetate membrane is used. The cellulose triacetate membrane is prone to rotting unless protected by chlorinated water, while the thin film composite membrane is prone to breaking down under the influence of chlorine. In cellulose triacetate membrane systems, a carbon postfilter is needed to remove chlorine from the final product, water.

Reverse osmosis (RO) is a water purification technology that uses a semi permeable membrane to remove larger particles from drinking water. In reverse osmosis, an applied pressure is used to overcome osmotic pressure, a colligative property that is driven by chemical potential, a thermodynamic parameter. Reverse osmosis can remove many types of molecules and ions from solutions, including bacteria, and is used in both industrial processes and the production of potable water. The result is that the solute is retained on the pressurized side of the membrane and the pure solvent is allowed to pass to the other side. To be "selective", this membrane should not allow large molecules or ions through the pores (holes), but should allow smaller components of the solution (such as the solvent) to pass freely.

In the normal osmosis process, the solvent naturally moves from an area of low solute concentration (high water potential), through a membrane, to an area of high solute concentration (low water potential). The movement of a pure solvent is driven to reduce the free energy of the system by equalizing solute concentrations on each side of a membrane, generating osmotic pressure. Applying an external pressure to reverse the natural flow of pure solvent, thus, is reverse osmosis. The process is similar to other membrane technology applications. However, key differences are found between reverse osmosis and filtration. The predominant removal mechanism in membrane filtration is straining, or size exclusion, so the process can theoretically achieve perfect exclusion of particles regardless of operational parameters such as influent pressure and concentration. Moreover, reverse

osmosis involves a diffusive mechanism, so that separation efficiency is dependent on solute concentration, pressure, and water flux rate. Reverse osmosis is most commonly known for its use in drinking water purification from seawater, removing the salt and other effluent materials from the water molecules^{9,10}.



Aim and Objective

The Drinking Water Safety Survey of Doctors was conducted with the aims of:

- Understanding healthcare professionals' opinion, attitude, perception and knowledge regarding various water purification process and technologies.
- Understanding the compliances against recommendation among their patients

The sample comprised 800 doctors from all major cities of India.

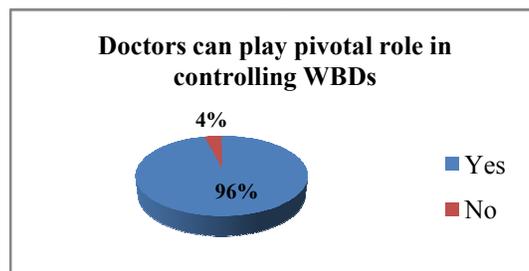
Key findings

Doctor's Role in controlling water borne diseases:

Doctors opined that they would play the pivotal role in controlling water borne disease. Except few, all the doctors (96%) agree that their role is very important in prevention of water borne disease.

Statement: Doctors would play a pivotal role in preventing and controlling water borne diseases.

Response: 96% doctors agree that they can play a pivotal role in controlling vector borne disease, while very few i.e only 4% doctors disagree with this statement.

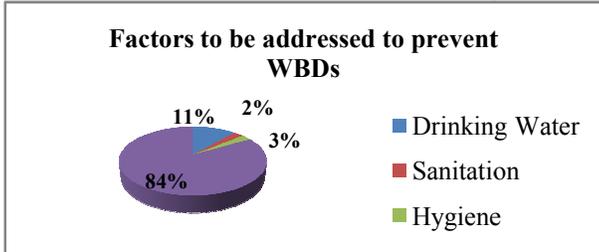


Controlling Factors

Majority of doctors believes that all three factors should be completely taken in account to control water borne diseases.

Statement: Factors i.e Drinking water, Sanitation and Hygiene is the most important to be addressed to prevent Water borne disease.

Response: Majority (84%) of doctors say that all the three factors should be taken care for preventing the outbreak of water borne diseases.

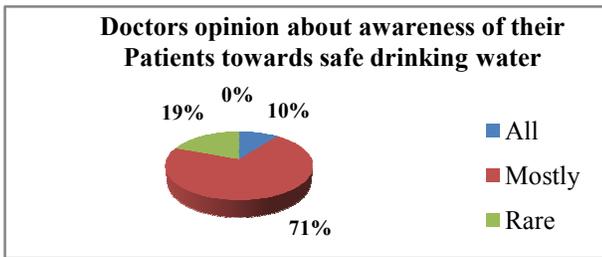


Mass Awareness towards Safe Water

Majority of doctor says that their patients are mostly aware about importance of safe drinking water.

Question: How many of doctor's patients are aware about importance of safe drinking water?

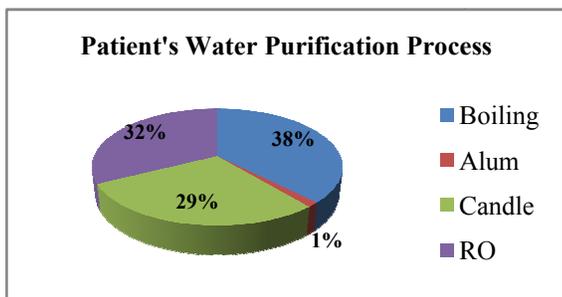
Response: 7 out of 10 doctors say that that majority of their patients are quite aware about importance of safe drinking water. All the patients of 10% of Doctors from the sample are aware about safe drinking water.



Purification Process of Patients

Boiling of water is the commonest purification process of patients of the doctors participated in the survey. One third of the patients (of these doctors) filter their water through RO system in their households.

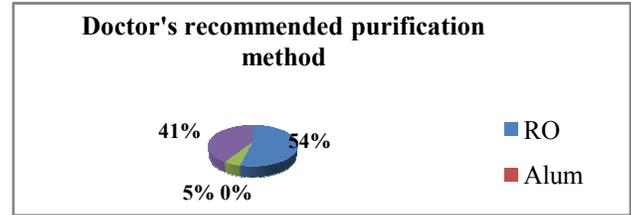
Finding: The commonest water purification method was boiling as said by 38% of doctors among surveyed respondents. One third doctors opined that their patient commonly use RO to filter their water for drinking. While patients of rest of 29% doctors commonly filter their water with candle filters.



Commonly recommended Water Cleaning Process (by Doctors)

Majority of doctors recommend RO method for water filtration while 4 out of 10 doctors rely on boiling.

Finding: 54% doctors recommend RO, 41% boiling and 5% candle filtration for filtering drinking water. None of the doctors in the survey go for alum as purification method,

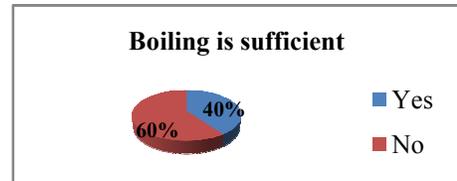


Boiling of Water

Majority of doctors believe that boiling is not sufficient to clean dissolved impurities in the water.

Statement: Boiling of water is sufficient to clean dissolved water impurities

Response: 60% doctors do not believe that boiling alone can clean dissolved impurities while 40% still believe that boiling is sufficient to clean water.

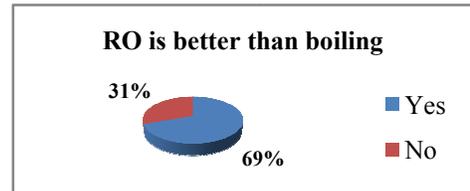


RO Water

Majority of doctors believe that RO method is better than boiling for better health of their patients

Statement: RO water is better for the health of patient than boiled water

Response: 69% doctors do believe that RO water is better than boiled water for the health of their patients.

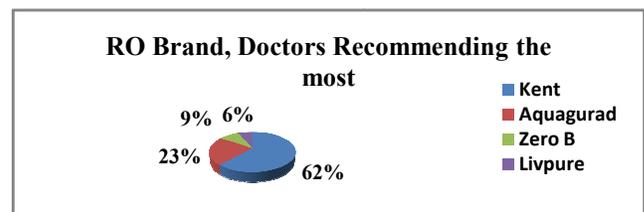


Preference of RO Brands

Kent RO is the most recommended brand by doctors.

Probe: The most recommended RO brand by doctors.

Response: 62% doctors participated in the survey recommend Kent RO the most to their patients while 23% doctors recommend Aquaguard water purifier.

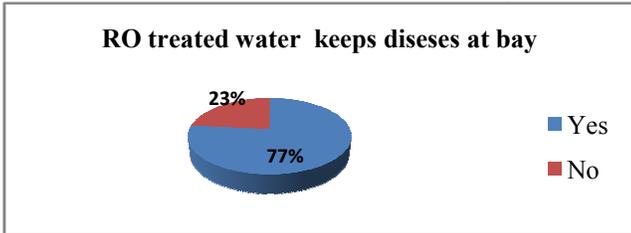


Disease prevention by RO water

Majority of Doctors do believe that drinking RO water keeps the diseases at bay

Statement: Drinking RO treated water, can keep diseases at bay.

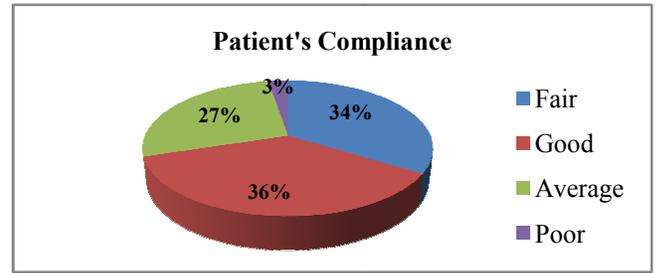
Response: 77% doctors participated in the said that RO treated water keeps the diseases at bay, while 23% did not agree that RO water can take guard of disease.



Disease prevention by RO water

Majority of Doctors said that most of their patients comply for their recommendation for drinking safe and clean water.

Finding: 34% doctors said that their patient fairly comply their recommendation for safe drinking water, while 36% said for good compliance and 27% said for average compliance.



Background:

Around 37.7 million people are affected by waterborne diseases annually (viral hepatitis, cholera, jaundice, typhoid are examples) while 1.5 million children die from diarrhea alone every year.

10 million people are vulnerable to cancers from excessive arsenic and another 66 million are facing risk of fluorosis, now endemic in 17 States

India loses 200 million person days and Rs 36,600 Crore every year.

India's Water Problems

- India is the largest user of groundwater in the world
- 60% agri & 85% drinking water
- Most groundwater becoming hazardous to drink

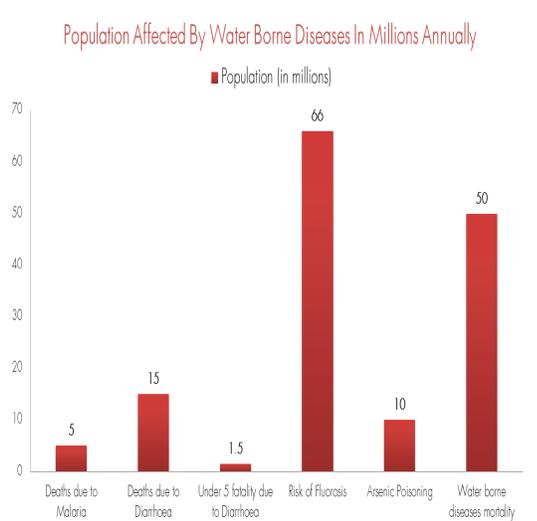


- 10 million people suffer from diarrhea annually
- 700,000 annual deaths from diarrhea
- 200,000 children under 5 die of diarrhea



- Over half of all Indians do not have access to a toilet
- 80% of sewage flows untreated into rivers
- 70% of surface water and 30% of river stretches are polluted





The health burden of poor water quality is enormous. It is estimated that around 37.7 million Indians are affected by waterborne diseases annually, 1.5 million children are estimated to die of diarrhoea alone and 73 million working days are lost due to waterborne disease each year. The resulting economic burden is estimated at \$600 million a year. The problems of chemical contamination is also prevalent in India with 1,95,813 habitations in the country are affected by poor water quality. The major chemical parameters of concern are fluoride and arsenic. Iron is also emerging as a major

problem with many habitations showing excess iron in the water samples.

The basis method through which urban Indians make their water safe for drinking is filtration. The general population still not aware about proper purification process of water. The health professionals recommend various water purification processes/methods but there is no any consensus. Taking the scenario in account Women Health Organization had conducted a national survey about opinion of healthcare professionals towards various water purification processes. The survey had been conducted under the guidance of qualified faculties from Women Health Organization working in social health domain who were be equally supported by professional researchers.

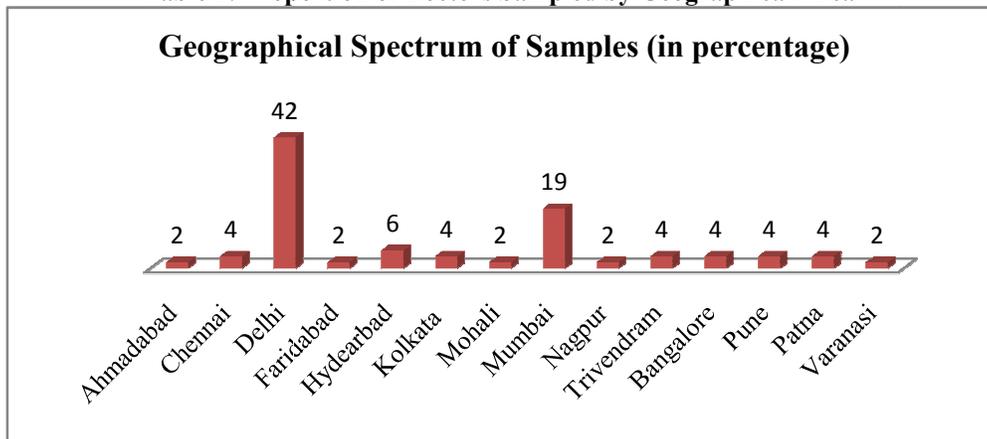
METHODOLOGY

Hard copy (paper-based) versions of the survey instruments were used to survey a randomly selected sample population within a national geographical location. Printed questionnaires were sent/given to the sample by the Women HO. All responses were captured electronically and stored securely at Women HO head office at New Delhi.

Sampling frame

Doctors were sampled according to their geographical location. In total, the survey hard copies were sent to 800 doctors Table 1 shows the proportion of doctors sampled by geographical area.

Table 1: Proportion of Doctors Sampled by Geographical Area



Questionnaire Design

Questionnaires for doctors were based on draft versions developed by the Project Advisory Group, with input from experts in public health epidemiology. The questionnaire contained questions about doctors role in prevention of WBD (Water Borne Diseases), factors causing WBD, awareness among masses about importance of safe drinking water, doctors opinion about boiling of water and RO purification and patients compliances etc.

Data cleaning

Logical error checks were completed to ensure data consistency. A small number of errors were identified and corrected in the final file.

CONCLUSION

With analysis, the team concludes as:

1. Doctors can play a major role in controlling water borne diseases
2. Patients are aware about the importance of safe drinking water but they are not complying with it well.
3. Doctors opine that RO treated water is safer than boiled water.
4. Doctors believe that RO treated water reduces the incidence of water borne diseases effectively.

ACKNOWLEDGEMENTS

The “**Drinking Water Safety Survey**” of Doctors was funded by *Women Health Organization* as part of the *Women HO*’s Safe Drinking Water Program. The strategic directions were guided by an Advisory Committee of Women HO. The work of the Advisory Committee was complemented by an Expert Reference Group (ERG) which has a broad representation across the healthcare sectors nationally.

The survey questionnaire and methodology were developed by *Women HO* with inputs from a Project Advisory Group comprising leading experts in preventive health.

The survey was conducted by Women HO. The analysis and reporting in this report were undertaken by Women HO.

Women HO would like to acknowledge the following individuals and organisations for their contribution to the project:

The doctors who participated in the survey.

The research and writing team of Women HO.

The field team who got the feedback from doctors.

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ANNEXURE I

QUESTIONNAIRE

1. Do you feel that doctors would play a pivotal role in preventing and controlling water borne diseases?
 - a. Yes
 - b. No
2. What do you feel is the most important thing which should be addressed first in prevention / controlling of water borne diseases?
 - a. Drinking Water
 - b. Sanitation
 - c. Hygiene
 - d. All of the above have same importance
3. How many of your patients are aware about importance of safe drinking water?
 - a. All
 - b. Mostly
 - c. Rare
 - d. None

4. What is the commonest water purification process practiced by your patients in their household?
 - a. Boiling
 - b. Use of Alum
 - c. Candle Filter
 - d. RO

5. What cleaning process do you generally recommend to your patient the most?
 - a. RO
 - b. Use of Alum
 - c. Candle Filter
 - d. Boiling

6. Do you feel boiling of water is sufficient to clean dissolved water impurities?
 - a. Yes
 - b. No

7. Is RO water better for health of your patient than boiled water?
 - a. Yes
 - b. No

8. Which RO method, do you recommend the most to your patients?
 - a. Kent's Ro+UF+UV+TDS Control Technology
 - b. Aquaguard RO+UF+UV Technology
 - c. Zero B's HRR Technology
 - d. Livpure's triple water purification system

9. Do you feel drinking RO water, can keep diseases at bay?
 - a. Yes
 - b. No

10. What is the compliance of your patients (of drinking safe water) post instruction?
 - a. Fairly Good
 - b. Good
 - c. Average
 - d. Poor

Source of support: Women Health Organization, Conflict of interest: None Declared