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Long-Term Safety of Reverse Osmosis Plants in Sri Lanka - Part II

This is the second article of two in a series on "Long-Term Safety of Reverse Osmosis Plants in Sri Lanka"

Health Consequences of Reverse Osmosis Water

Long-term consumption of RO water comes with several potential drawbacks. WHO and health professionals caution against excessive RO use. Adverse effects in countries like Czechoslovakia and Slovakia due to mineral deficiencies are noted. Regulatory bodies emphasize the need for oversight to ensure balanced water purification methods.

One of the main concerns is mineral deficiency, as RO systems remove essential minerals like calcium and magnesium, which are vital for various bodily functions. Over time, a diet lacking these minerals can lead to health issues. Additionally, RO water tends to be more acidic due to the removal of alkaline minerals, which may not be suitable for individuals with acid reflux or sensitive stomachs. Another concern is the significant amount of wastewater generated during the RO process, which can be particularly wasteful in regions where water scarcity is an issue. To mitigate these effects, some RO systems are equipped with a remineralization stage to add essential minerals back into the water. Those who primarily drink RO water should consider incorporating mineral-rich foods and supplements into their diet. For those concerned about acidity, pH-balancing methods or devices can be used to make RO water less acidic. Additionally, choosing water-efficient RO systems can help reduce the amount of water wasted during purification.

In response to the issues arising from the widespread use of RO technology for water treatment in various parts of the island, the Ministry of Health (MoH) has developed a set of health guidelines. These guidelines were formulated following consultative meetings, and reviewed by an expert panel that included representatives from the MoH, the National Water Supply and Drainage Board, and the Government Analysis Department. The guidelines aim to minimize potential adverse health and environmental impacts associated with RO plants. However, despite these efforts, gaps remain in the implementation process, particularly in ensuring effective collaboration between health and non-health authorities responsible for maintaining, distributing, transporting, and conducting chemical testing, as well as in supervision and monitoring efforts.

Efficacy and Current Implementation

RO plants in Sri Lanka have demonstrated efficacy in reducing the incidence of CKDu by removing harmful chemical constituents from groundwater, including excessive levels of magnesium, fluoride, and hardness (Imbulana, 2022). Studies such as those by Goonesinghe and Gunatileka (2023) highlight that RO-treated water has been linked with anecdotal evidence of slowing down CKDu progression, though more robust studies are needed. Globally, however, the long-term implications of RO usage on both public health and the environment require closer scrutiny.

Economic Feasibility and Sustainability

The financial viability of RO plants, as studied by Bandara and Witharana (2023), suggests that these systems can be economically sustainable in certain regions, such as Dimbulagala, where operation and maintenance costs are covered by community-generated income. Yet, the sustainability of these systems over the long term is contingent upon consistent maintenance, local community engagement, and proper training of operators. Internationally, the economic sustainability of RO systems has been questioned, particularly in low-income regions where the costs of operation and maintenance can be prohibitive (Gude, 2016). Without these factors, RO plants may face challenges in longevity and effectiveness.

Contents

Environmental Impact

One of the most concerning aspects of RO plants is the environmental impact of RO reject water. The research by Vigneswaran et al. (2021) on soil quality in disposal sites of Vavuniya reveals significant deterioration of soil health due to the accumulation of salts and other chemicals from rejected water. Globally, the environmental consequences of RO reject water have been documented, particularly in arid regions like the Middle East, where the high salt concentrations in rejected water can exacerbate soil salinity (Lattemann & Höpner, 2008). If not properly managed, these by-products can lead to long-term environmental degradation, which in turn can affect agricultural productivity and local ecosystems.

Challenges in Operation and Maintenance

The performance of RO plants is also influenced by operational challenges. Studies like those conducted by Imbulana (2022) and Indika et al. (2022) highlight issues such as low recovery rates, membrane fouling, and poor disinfection practices. These operational challenges are not unique to Sri Lanka; globally, membrane fouling remains a major challenge in maintaining RO efficiency (Lee & Elimelech, 2006). These operational challenges, coupled with a lack of technical knowledge among local communities, could compromise the long-term safety and effectiveness of RO plants. Ensuring proper training and regular maintenance is crucial to overcoming these obstacles.

Conclusion and Recommendations:

The introduction of RO technology has been a vital step in addressing the CKDu crisis in Sri Lanka. However, its long-term safety depends on a multifaceted approach that includes economic sustainability, environmental protection, and community education. Further research is essential to assess the full impact of RO systems over time, with a focus on minimizing their environmental footprint and improving operational standards. Globally, best practices in RO technology management should be studied and adapted to the Sri Lankan context. Strict regulatory frameworks should be established to oversee the maintenance of these plants and the safe disposal of RO reject water, ensuring that the benefits of RO technology do not come at the expense of public health or environmental integrity.

Ultimately, the choice to consume RO water over the long term should be tailored to individual circumstances, considering dietary requirements, health concerns, and the quality of local water supply. Seeking advice from a healthcare provider or a water quality expert can offer personalized recommendations on the most appropriate water source and treatment method for specific medical conditions.

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References:

1. Bandara, T., & Witharana, A. (2023). Economic Feasibility of Reverse Osmosis (RO) Water Treatment Plants: A Case Study from Dimbulagala, Polonnaruwa, Sri Lanka.

2. Goonesinghe, V., & Gunatileka, S. (2023). Efficacy of Reverse Osmosis in Reducing Chronic Kidney Disease of Unknown Etiology in Sri Lanka: A Narrative Review.

3. Gowda et al (2020). Study On RO Water Treatment Plant at Adakamaranahalli. International Journal of Research in Engineering, Science and Management. Volume-3, Issue-6, June-2020. www.ijresm.com.

4. Gude, V.G. (2016). Desalination and Water Reuse to Address Global Water Scarcity. Journal of Environmental Chemical Engineering, 4(2), 2166-2173.

5. Guideline for the Operation of Water Treatment Plant using RO Technique (2016). Food Control Administration Unit, Ministry of Health http://eohfs.health.gov.lk/food/images/pdf/directives/5all.pdf

6. Imbulana, S.M. (2022). Groundwater Quality in the Endemic Areas of Chronic Kidney Disease of Unknown Etiology in Sri Lanka and Its Treatment by Community-Based Reverse Osmosis Water Treatment Plants.

7. Indika, S., Wei, Y., Hu, D., Ketharani, J., Ritigala, T., Cooray, T., Hansima, M.A.C.K., Makehelwala, M., Jinadasa, K.B.S.N., Weragoda, S.K., & Weerasooriya, R. (2022). Evaluation of Performance of Existing RO Drinking Water Stations in the North Central Province, Sri Lanka.
   Jayasumana, C. (2016). Reverse osmosis plant maintenance and efficacy in chronic kidney disease endemic region in Sri Lanka. Environmental Health and Preventive Medicine.

8. Lattemann, S., & Höpner, T. (2008). Environmental Impact and Impact Assessment of Seawater Desalination. Desalination, 220(1-3), 1-15.

9. Lee, S., & Elimelech, M. (2006). Relating Organic Fouling of Reverse Osmosis Membranes to Intermolecular Adhesion Forces. Environmental Science & Technology, 40(3), 980-987.

10. Rummi D.S. (2017). Health Risks from Long Term Consumption of Reverse Osmosis Water. International Journal of Applied Chemistry. ISSN 0973-1792 Volume 13, Number 2 (2017) pp. 293-301. http://www.ripublication.com

11. Cons of Drinking RO Water in the Long Run (2024) Tesla healthy life. https://teslahealthylife.com/cons-of-drinking-water-in-long-run.

12. Vigneswaran, Y., Perera, T.A.N.T., Saravanan, S., & Jayasinghe, G.Y. (2021). Influence of Reverse Osmosis Reject Water on Soil Quality in Disposal Sites of Vavuniya, Sri Lanka.

Table 1 : Water Quality Surveillance Number of microbiological water samples July 2024			
District	**MOH areas**	**No: Expected ***	**No: Received**
Colombo	18	108	**18**
Gampaha	15	90	**NR**
Kalutara	13	78	**82**
Kalutara NIHS	2	12	**17**
Kandy	23	138	**25**
Matale	13	78	**19**
Nuwara Eliya	13	78	**18**
Galle	20	120	**133**
Matara	17	102	**109**
Hambantota	12	72	**8**
Jaffna	14	84	**152**
Kilinochchi	4	24	**13**
Mannar	5	30	**0**
Vavuniya	4	24	**47**
Mullatvu	6	36	**6**
Batticaloa	14	84	**17**
Ampara	7	42	**0**
Trincomalee	12	72	**0**
Kurunegala	29	174	**NR**
Puttalam	13	78	**NR**
Anuradhapura	23	138	**NR**
Polonnaruwa	9	54	**34**
Badulla	16	96	**0**
Moneragala	11	66	**21**
Rathnapura	20	120	**105**
Kegalle	11	66	**6**
Kalmunai	13	78	**20**

* No of samples expected (6 / MOH area / Month)
NR = Return not received

Table 1: Selected notifiable diseases reported by Medical Officers of Health 10th – 16th Aug 2024 (33rd Week)

RDHS	Dengue Fever A	Dengue Fever B	Dysentery A	Dysentery B	Encephalitis A	Encephalitis B	En. Fever A	En. Fever B	F. Poisoning A	F. Poisoning B	Leptospirosis A	Leptospirosis B	Typhus F. A	Typhus F. B	Viral Hep. A	Viral Hep. B	H. Rabies A	H. Rabies B	Chickenpox A	Chickenpox B	Meningitis A	Meningitis B	Leishmania- A	Leishmania- B	Tuberculosis A	Tuberculosis B	WRCD T*	WRCD C**
Colombo	266	7935	3	24	0	7	1	46	2	18	13	340	0	8	1	8	0	0	19	358	3	28	0	0	43	1436	100	100
Gampaha	123	3621	1	32	4	23	0	13	1	71	28	498	0	8	1	8	0	0	11	288	7	94	2	16	4	805	57	100
Kalutara	48	2037	0	19	0	2	1	30	0	34	11	518	0	7	0	8	0	1	4	431	2	41	0	1	20	418	87	100
Kandy	114	3240	1	31	0	2	0	9	0	54	2	183	1	24	0	8	0	1	3	301	0	13	0	31	50	435	100	100
Matale	18	538	2	11	0	0	3	7	1	20	2	77	0	2	0	4	0	0	2	114	0	10	10	200	2	85	92	100
Nuwara Eliya	10	268	1	104	0	6	0	9	0	199	6	141	0	31	0	5	0	0	5	173	0	15	0	1	1	182	85	100
Galle	40	1514	4	39	0	20	1	9	3	80	13	529	3	82	0	7	0	1	25	519	3	64	0	3	9	295	80	100
Hambantota	8	645	0	25	0	3	0	5	0	44	8	348	1	40	0	5	1	2	4	241	0	23	17	354	3	93	75	100
Matara	38	706	0	8	0	6	0	2	0	26	9	336	1	19	0	4	0	0	7	246	2	62	5	88	5	104	88	100
Jaffna	11	5177	2	49	0	2	0	23	1	32	0	17	4	439	0	5	1	1	7	160	3	16	0	1	0	180	100	93
Kilinochchi	3	282	1	10	0	0	0	2	0	2	0	17	0	10	0	0	0	0	1	7	0	5	0	0	0	18	100	100
Mannar	10	228	1	7	0	0	0	1	0	0	0	21	1	11	0	1	0	1	0	5	0	3	0	1	0	41	100	100
Vavuniya	5	159	2	12	0	1	0	1	0	21	3	75	0	4	0	4	0	0	1	33	1	16	0	8	0	26	75	100
Mullaitivu	1	192	0	7	0	0	0	0	0	17	0	64	0	11	0	0	0	0	0	4	0	4	1	9	0	23	100	100
Batticaloa	22	1316	1	96	0	10	0	6	0	52	0	59	0	2	0	17	0	2	1	86	2	34	0	3	4	107	86	100
Ampara	9	215	1	27	0	3	0	0	0	17	1	152	0	1	0	5	1	1	3	87	0	29	2	19	1	93	57	100
Trincomalee	10	606	0	13	0	1	0	3	0	5	1	128	0	12	0	3	0	0	3	59	0	11	2	15	3	79	50	100
Kurunegala	31	1826	0	38	0	28	0	3	0	345	10	462	1	18	0	4	1	3	21	373	5	203	12	432	10	361	76	100
Puttalam	16	874	0	5	0	3	0	3	0	3	6	181	3	22	2	3	0	1	5	102	3	51	2	27	4	146	69	100
Anuradhapura	16	608	1	17	0	6	0	2	0	38	4	321	0	27	2	10	0	1	6	195	2	39	18	610	7	200	91	100
Polonnaruwa	8	293	0	17	0	0	0	1	0	6	5	211	0	2	5	41	0	0	6	104	1	25	8	355	4	80	89	100
Badulla	9	666	1	26	0	5	0	4	0	31	9	391	3	29	0	21	0	0	11	265	2	26	3	30	6	161	88	100
Monaragala	13	593	0	14	0	3	0	3	0	84	0	560	2	25	1	26	1	1	3	85	0	69	3	174	9	82	91	100
Ratnapura	38	2044	0	79	0	5	0	8	0	15	23	1265	0	20	0	19	0	0	7	234	0	95	3	126	6	220	90	100
Kegalle	37	1569	0	12	0	6	0	9	0	11	14	510	0	22	0	9	0	1	14	625	2	49	1	20	16	246	73	100
Kalmunai	7	633	0	15	0	0	0	1	0	8	3	61	0	5	0	4	0	0	4	167	0	11	0	0	3	95	92	100
SRILANKA	911	37785	22	737	4	142	6	200	8	1233	171	7465	21	881	13	229	2	19	173	5262	38	1036	89	2524	210	5945	84	99

Table 2: Vaccine-Preventable Diseases & AFP

10th – 16th Aug 2024 (33rd Week)

Disease	No. of Cases by Province									Number of cases during current week in 2024	Number of cases during same week in 2023	Total number of cases to date in 2024	Total number of cases to date in 2023	Difference between the number of cases to date in 2024 & 2023
	W	C	S	N	E	NW	NC	U	Sab					
AFP*	01	00	00	00	00	00	01	00	02	04	05	47	64	-26.5 %
Diphtheria	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Mumps	03	00	00	00	00	00	01	00	00	04	10	183	152	20.4 %
Measles	19	00	05	00	00	00	00	00	00	24	53	272	292	-6.8 %
Rubella	00	00	00	00	00	00	00	00	00	00	02	02	03	-33.3 %
CRS**	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Tetanus	00	00	00	00	00	00	00	00	00	00	00	05	06	-16.6 %
Neonatal Tetanus	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Japanese Encephalitis	00	00	00	00	00	00	00	00	00	00	00	06	02	200 %
Whooping Cough	00	00	00	00	00	00	00	00	00	00	00	39	05	680 %

Key to Table 1 & 2

Provinces:　　　**W**: Western, **C**: Central, **S**: Southern, **N**: North, **E**: East, **NC**: North Central, **NW**: North Western, **U**: Uva, **Sab**: Sabaragamuwa.

RDHS Divisions:　**CB**: Colombo, **GM**: Gampaha, **KL**: Kalutara, **KD**: Kandy, **ML**: Matale, **NE**: Nuwara Eliya, **GL**: Galle, **HB**: Hambantota, **MT**: Matara, **JF**: Jaffna,
　　　　　　　　KN: Killinochchi, **MN**: Mannar, **VA**: Vavuniya, **MU**: Mullaitivu, **BT**: Batticaloa, **AM**: Ampara, **TR**: Trincomalee, **KM**: Kalmunai, **KR**: Kurunegala, **PU**: Puttalam,
　　　　　　　　AP: Anuradhapura, **PO**: Polonnaruwa, **BD**: Badulla, **MO**: Moneragala, **RP**: Ratnapura, **KG**: Kegalle.

Data Sources:

Weekly Return of Communicable Diseases: Diphtheria, Measles, Tetanus, Neonatal Tetanus, Whooping Cough, Chickenpox, Meningitis, Mumps., Rubella, CRS,

Special Surveillance: AFP* (Acute Flaccid Paralysis), Japanese Encephalitis

CRS** =Congenital Rubella Syndrome

NA = Not Available

Take prophylaxis medications for leptospirosis during the paddy cultivation and harvesting seasons.

It is provided free by the MOH office / Public Health Inspectors.

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