WEEKLY EPIDEMIOLOGICAL REPORT

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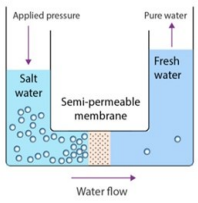
Long-Term Safety of Reverse Osmosis Plants in Sri Lanka: An Epidemiological Perspective

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

Introduction

Reverse osmosis (RO) is a widely used water purification technique that originated in the 1950s, initially for desalinating seawater. Over time, advancements in technology, particularly in polymers and membrane efficiency, have expanded its use in industrial, residential, commercial, and scientific applications.

The principle of reverse osmosis involves using a semipermeable membrane that allows only the solvent (usually water) to pass through while retaining larger solute molecules. In this process, pressure is applied to the solution side (where the solute concentration is high), forcing the solvent to move through the membrane to the side with lower solute concentration. This movement occurs against the natural concentration gradient, hence the term "reverse osmosis."



For reverse osmosis to occur, the applied pressure must exceed the osmotic pressure, which is the minimum pressure needed to prevent solvent flow through the membrane. Osmotic pressure is related to the concentration of the solution and is important for the effectiveness of the reverse osmosis process. Today, RO technology is a key component in many water purification systems, providing clean water by removing impurities through this process.

Reverse Osmosis in Global and Regional Context

Globally the use of RO water has grown in popularity since its introduction as a home purification system in the 1970s, and it is now commonly used by bottled water companies. The World Health Organization has highlighted health risks associated with demineralized drinking water, raising concerns about the long-term safety of consuming RO-treated water. RO systems have been recognized for their effectiveness in removing a broad spectrum of contaminants, as shown in studies from Asia and India. A study conducted on the RO water treatment plant at Adakamaranahalli India in 2020 found that the treatment process involves several stages, including rapid sand filtration, carbon filtration, softening, chlorination, cartridge filtration, and reverse osmosis. The treated water produced by the plant is considered safe for drinking, while the rejected water, which contains high concentrations of various ions, is not suitable for household use. The plant operates with an overall efficiency of 60% to 70%, but it rejects nearly 50% of the water it processes, emphasizing the importance of reusing this water for sustainability. However, this process also removes essential minerals like sodium, magnesium, and iron, making the water potentially unhealthy for consumption.

Reverse Osmosis in Local Context

Reverse osmosis (RO) water treatment plants are an important intervention in addressing Chronic Kidney Disease of Unknown Etiology (CKDu) in Sri Lanka, particularly in the dry zones. These community-based RO plants are employed as a temporary solution to provide safe drinking water in affected areas, and RO-treated groundwater is recognized for its potential to slow CKDu progression (Imbulana, 2022). However, concerns remain about the long-term safety and sustainability of these systems.

Anuradhapura and Polonnaruwa districts in North Central Province (NCP) are the most affected areas by CKDu, likely due to poor groundwater quality.

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Chronic Interstitial Nephritis in Agricultural Communities (CINAC) considerably impacts farmers in NCP. To mitigate this, RO plants have been established to purify water and reduce exposure to potential nephrotoxins. The study by Jayasumana (2016) has assessed the maintenance and efficacy of RO plants in NCP, revealing that while these plants effectively reduce total dissolved solids (TDS) to an average of 29 ppm, there is significant variability in maintenance and operational practices. This inconsistency could potentially impact water quality and the longevity of the plants. Building on this, Indika et al. (2021) investigated 101 Community-Based Organization (CBO)-operated RO stations across NCP. The study highlighted the widespread use of these stations in rural areas, noting that the majority of RO systems (>93%) demonstrated high salt rejection rates. However, water recovery rates varied significantly, ranging from 19.4% to 64%, indicating the possibility for improvement in the efficiency of these systems.

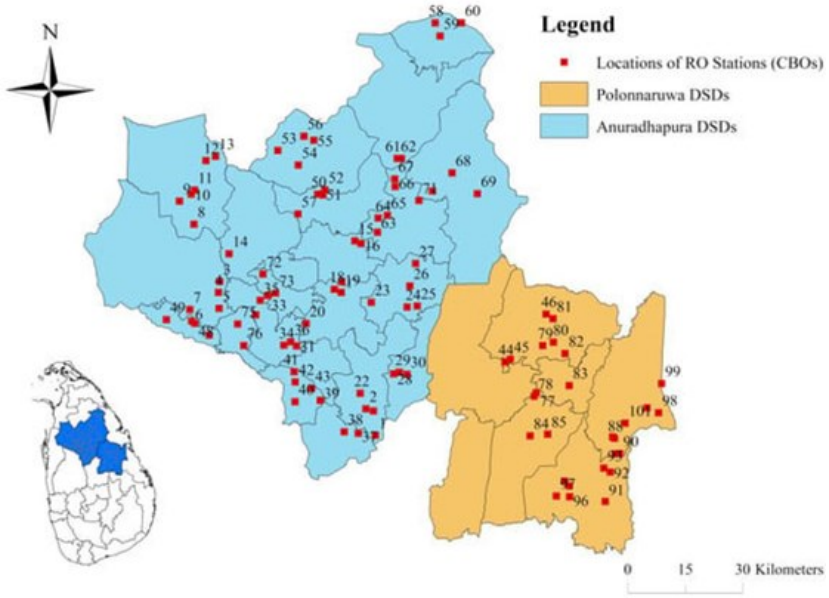

Figure 2. Locations of Community-Based organization-operated RO stations in North Central Province. (Source - Jayasumana, C. (2016). Reverse osmosis plant maintenance and efficacy in chronic kidney disease endemic region in Sri Lanka. Environmental

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 To be Continued....

Table 1: Selected notifiable diseases reported by Medical Officers of Health 03rd – 09th Aug 2024 (32nd Week)

RDHS	Dengue Fever		Dysentery		Encephalitis		En. Fever		F. Poisoning		Leptospirosis		Typhus F.		Viral Hep.		H. Rabiies		Chickenpox		Meningitis		Leishmania-		Tuberculosis		WRCD	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	T*	C**
Colombo	279	7669	0	21	0	7	0	45	0	16	11	327	0	8	0	7	0	0	3	339	0	25	0	0	43	1393	100	100
Gampaha	174	3498	2	31	4	19	1	13	0	70	19	470	2	8	0	7	0	0	7	277	2	87	0	14	44	801	86	100
Kalutara	50	1989	0	19	0	2	0	29	0	34	14	507	0	7	0	8	0	1	13	427	0	39	0	1	9	398	87	100
Kandy	120	3126	1	30	0	2	0	9	0	54	5	181	1	23	0	8	0	1	5	298	0	13	1	31	0	385	96	100
Matale	14	520	0	9	0	0	0	4	0	19	0	75	0	2	0	4	0	0	1	112	0	10	13	190	0	83	92	100
Nuwara Eliya	5	258	1	103	1	6	0	9	1	199	4	135	1	31	0	5	0	0	3	168	1	15	0	1	8	181	100	100
Galle	46	1474	2	35	0	20	0	8	5	77	20	516	4	79	0	7	0	1	16	494	4	61	0	3	9	286	100	100
Hambantota	5	637	0	25	0	3	0	5	0	44	4	340	2	39	0	5	0	1	3	237	1	23	4	337	2	90	75	100
Matara	29	668	0	8	1	6	0	2	0	26	8	327	1	18	0	3	0	0	3	239	0	60	0	83	1	99	100	100
Jaffna	6	5166	0	47	0	2	1	23	0	31	0	17	5	435	0	5	0	1	3	153	0	13	0	1	0	180	86	93%
Kilinochchi	6	279	0	9	0	0	0	2	0	2	0	17	0	10	0	0	0	1	0	6	0	5	0	0	2	18	100	100
Mannar	3	218	1	6	0	0	0	1	0	0	0	21	0	10	0	1	0	0	0	5	0	3	0	1	0	41	80	100
Vavuniya	0	154	0	10	0	1	0	1	0	21	1	72	0	4	0	4	0	0	1	32	1	15	0	8	0	26	100	100
Mullaitivu	1	191	0	7	0	0	0	0	1	17	0	64	0	11	0	0	0	0	0	4	0	4	0	8	0	23	100	100
Batticaloa	20	1294	4	95	0	10	0	6	5	52	3	59	0	2	0	17	1	2	0	85	0	32	0	3	0	103	93	100
Ampara	5	206	0	26	0	3	0	0	0	17	3	151	0	1	0	5	1	1	2	84	0	29	2	17	2	92	57	100
Trincomalee	12	596	0	13	0	1	0	3	0	5	1	127	0	12	0	3	0	0	6	56	0	11	0	13	0	76	92	100
Kurunegala	39	1795	2	38	3	28	0	3	0	345	6	452	1	18	0	4	0	2	7	352	2	198	20	420	18	351	93	100
Puttalam	24	858	0	5	0	3	0	3	0	3	9	175	5	19	0	1	0	1	2	97	2	48	1	25	0	142	100	100
Anuradhapura	10	592	3	16	0	6	0	2	0	38	8	317	0	27	0	8	0	1	5	189	2	37	26	592	6	193	91	100
Polonnaruwa	4	285	1	17	0	0	0	1	0	6	1	206	0	2	5	36	0	0	7	98	0	24	8	347	0	76	89	100
Badulla	18	657	1	25	0	5	0	4	0	31	5	382	3	26	1	21	0	0	10	254	2	24	0	27	3	155	94	100
Monaragala	12	580	0	14	0	3	0	3	6	84	4	560	0	23	2	25	0	1	2	82	2	69	7	171	1	73	91	100
Ratnapura	51	2006	4	79	0	5	0	8	0	15	41	1242	1	18	0	19	0	2	7	227	2	95	0	123	7	214	95	100
Kegalle	20	1532	1	12	0	6	1	9	0	11	23	496	1	22	0	9	0	1	15	611	3	47	0	19	2	230	91	100
Kalmunai	7	626	0	15	0	0	0	1	0	8	2	58	0	5	0	4	0	0	6	163	0	11	0	0	7	92	92	100
SRILANKA	**960**	**36874**	**23**	**715**	**9**	**138**	**3**	**194**	**18**	**1225**	**192**	**7294**	**27**	**860**	**8**	**216**	**2**	**17**	**127**	**5089**	**24**	**998**	**82**	**2435**	**164**	**5735**	**92**	**99%**

Source: Weekly Returns of Communicable Diseases (esurvillance.epid.gov.lk). T=Timeliness refers to returns received on or before 09th Aug, 2024 Total number of reporting units 358 Number of reporting units data provided for the current week: 357**C****-Completeness *

A = Cases reported during the current week. B = Cumulative cases for the year.

Table 2: Vaccine-Preventable Diseases & AFP

03rd – 09th Aug 2024 (32nd 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	00	00	00	01	04	43	60	-28.3 %
Diphtheria	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Mumps	03	02	00	00	00	00	00	00	00	05	02	179	142	26.1 %
Measles	01	00	00	00	00	00	00	00	00	13	60	247	239	3.3 %
Rubella	00	00	00	00	00	00	00	00	00	00	00	02	01	100 %
CRS**	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Tetanus	00	00	00	00	01	00	00	00	00	01	00	05	06	-16.6 %
Neonatal Tetanus	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Japanese Enceph-alitis	00	00	00	00	00	00	00	00	00	00	00	06	02	200 %
Whooping Cough	00	00	01	00	00	00	00	00	01	02	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.

Comments and contributions for publication in the WER Sri Lanka are welcome. However, the editor reserves the right to accept or reject items for publication. All correspondence should be mailed to The Editor, WER Sri Lanka, Epidemiological Unit, P.O. Box 1567, Colombo or sent by E-mail to **chepid@sltnet.lk. Prior approval should be obtained from the Epidemiology Unit before publishing data in this publication**

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