A Laboratory Comparative Analytical Study of Water Stored in Silver, Earthen, and Aluminum Vessels

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Abstract- Ayurveda emphasizes Ahara (diet) and Jala (water) as fundamental determinants of health. Ancient texts such as *Charaka Samhita* and *Sushruta Samhita* recommend storing water in vessels made of gold, silver, copper, or clay to preserve purity and prevent diseases. In modern times, with growing concerns of pollution and waterborne infections, the safety of drinking water has become a critical issue. This study was undertaken to compare the impact of storing water in silver, earthen, and aluminum vessels on its physico-chemical and microbiological properties.

Samples from three water sources (corporation, well, and lake) were stored in the selected vessels for 24, 72, and 120 hours. Parameters including pH, turbidity, hardness, TDS, residual chlorine, calcium, magnesium, nitrates, fluorides, and microbial counts were assessed. Findings revealed that silver vessels eliminated coliform organisms completely, while earthen vessels moderately reduced microbial load and turbidity. In contrast, aluminum vessels did not prevent contamination and showed unstable physico-chemical parameters.

This study provides scientific validation to Ayurvedic recommendations, suggesting that silver and earthen vessels can serve as safe, cost-effective, and sustainable alternatives for water storage, especially in rural or resource-limited settings.

Keywords— Ayurveda, Drinking Water, Silver, Earthen Vessel, Aluminum, Water Quality, Storage

I. INTRODUCTION

Water (*jala*) is described in Ayurveda as "amrita-sadrusha" (life-giving like nectar), essential not only for sustaining life but also for maintaining the balance of dosha, dhatu, and mala. Acharya Charaka emphasizes the dual purpose of Ayurveda: *"Swasthasya swasthya rakshanam aturasya vikara prashamanam cha"* — preservation of health and management of disease. Safe water (*shuddha jala*) thus forms the foundation of preventive health.

Ayurvedic seers recommended storing water in vessels of gold, silver, copper, and clay, attributing to them rasayana (rejuvenating) and roga-nashaka (disease-preventing) properties. *Sushruta Samhita* describes specific benefits, noting silver's purifying qualities and clay's natural cooling effect.

In contemporary times, water contamination is a pressing global issue. In India, pollution from industrial waste, agricultural runoff, and inadequate sanitation leads to chemical and microbial contamination. Coliform bacteria, especially *E. coli*, are widely used indicators of fecal pollution and potential disease transmission.

Modern studies corroborate Ayurvedic wisdom: silver has oligodynamic antimicrobial action, earthen vessels improve palatability and cooling, while aluminum has raised concerns about leaching and neurotoxicity. Since rural households commonly store water for 3–5 days, evaluating changes during storage becomes highly relevant for public health safety.

This study was thus designed to compare the effects of storing water in silver, earthen, and aluminum vessels on physico-chemical and microbiological quality, and to analyze whether these findings align with Ayurvedic recommendations.

II. AIM AND OBJECTIVES

Aim: To conduct a comparative analytical study of water stored in silver, earthen, and aluminum vessels with respect to its quality and safety.

Objectives:

1. To analyze physico-chemical parameters of stored water across different vessels.
2. To evaluate microbiological safety (coliform counts) after storage.
3. To compare outcomes between corporation, well, and lake water samples.
4. To validate Ayurvedic principles of *jala shuddhi* with modern laboratory findings.

III. MATERIALS AND METHODS

Study Design

A laboratory-based comparative analytical study.

Sources of Water

- Corporation water (treated municipal supply)
- Well water (ground source)
- Lake water (surface source, higher contamination risk)

Storage Vessels

- Silver vessel
- Earthen vessel
- Aluminum vessel

Storage Duration

- 24 hours
- 72 hours
- 120 hours

Parameters Studied

1. Physical: pH, turbidity, hardness, TDS
2. Chemical: residual chlorine, calcium, magnesium, chlorides, nitrates, fluorides, sulphates, copper, iron
3. Microbiological: total coliform, fecal coliform, *E. coli* (Most Probable Number method)

Procedure

- Baseline water samples collected and analyzed.
- Samples stored in sterilized vessels of identical capacity under controlled laboratory conditions.
- Analysis conducted at 24, 72, and 120 hours following BIS and WHO guidelines.
- Data compared using descriptive and comparative statistics.

IV. RESULTS

- pH: Stable and within WHO permissible limits across all vessels.
- Turbidity & Hardness: Reduced significantly in earthen vessels due to natural filtration.
- Residual Chlorine: Best preserved in silver vessels; declined in aluminum.
- TDS: Stable in silver and earthen; fluctuated in aluminum.
- Microbiology:
  - Silver eliminated coliforms within 120 hrs across all water sources.
  - Earthen vessels showed partial reduction (better in corporation and well water; moderate in lake water).
  - Aluminum vessels failed to eliminate coliforms; contamination persisted.

Table: Microbiological Findings after 120 hrs

Source	Initial Coliform Count	Silver	Earthen	Aluminum
Corporation	Moderate	Nil	Reduced	Present
Well	High	Nil	Reduced	Present
Lake	Very High	Nil / Significant reduction	Moderate reduction	Present

V.DISCUSSION

This study demonstrates the scientific relevance of Ayurvedic practices of water storage.

1. Silver Vessels: Silver exhibited strong antimicrobial action, completely eliminating coliforms. This correlates with modern understanding of silver's oligodynamic effect, where silver ions disrupt bacterial cell membranes and enzymatic activity. The results reinforce *Sushruta's* recommendation of silver vessels for safe water storage.

2. Earthen Vessels: These showed partial microbial reduction and improved turbidity, supporting their natural filtration and cooling properties. Although not as effective as silver, they offer affordable and eco-friendly benefits, aligning with traditional practices of rural households.
3. Aluminum Vessels: Despite their widespread use, aluminum vessels neither reduced microbial load nor stabilized chemical properties. Concerns of aluminum leaching and potential health risks (e.g., neurotoxicity, Alzheimer's disease) make them unsuitable for long-term safe water storage.
4. Public Health Relevance: Waterborne diseases remain a major challenge in India. Silver and earthen vessels offer low-cost, culturally acceptable, and sustainable solutions in rural and low-resource areas where advanced purification systems may not be feasible.

Thus, Ayurvedic wisdom is validated by modern science, emphasizing the relevance of traditional practices in current healthcare.

VI.CONCLUSION

1. Silver vessels are most effective for ensuring microbiological safety of stored water.
2. Earthen vessels provide moderate protection, natural cooling, and palatability benefits.
3. Aluminum vessels are unsuitable for safe drinking water storage.
4. Ayurveda's classical recommendations for storing water in silver and earthen vessels are strongly supported by modern laboratory evidence.
5. Adoption of these traditional practices can significantly reduce waterborne disease burden, especially in rural India.

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