

Water Quality Management During the Ancient Period: A Historical and Scientific Exploration

Dr. Rajeev Ranjan
Dept. of History, SNKP Govt. College
Neem ka Thana , Rajasthan.

Abstract

Water quality management during the ancient period reflects a sophisticated understanding of environmental health, human hygiene, and resource sustainability. Early civilizations, particularly in the Indian subcontinent, recognized that pure water was essential for longevity, strength, and disease prevention. Vedic literature, including the *Atharvaveda*, emphasized the sacredness, purity, and medicinal value of water, urging communities to preserve its cleanliness. Ancient scholars such as Sushruta and Varāhamihira conducted systematic scientific observations on the physical, chemical, and sensory properties of water. Their classification of impurities—covering touch, appearance, taste, smell, potency, and metabolic effects—reveals an advanced awareness of water contamination and its impact on human health. They also described natural methods of purification, including filtration through sand and cloth, sedimentation, boiling, and the use of herbal agents such as clearing nuts, lotus roots, moss, and gomedaka stones. These methods not only ensured potable water but also reflected ecological intelligence that aligns with modern principles of sustainable water management. Rainwater, referred to as *Antariksha-jala*, was considered the purest form, whereas groundwater was valued for its natural filtration through soil layers. Studying these ancient practices provides valuable insight into traditional water governance systems, community responsibility, and early environmental ethics. Such knowledge forms an important foundation for modern water policy, especially in the context of global water scarcity and pollution challenges.

Keywords: Ancient water purification, Vedic literature, Sushruta, water quality management, traditional ecological knowledge

Introduction

Water is the prime component consumed by mankind. One can not live without it for a longer period. It has been realised by our ancestors that the water which to be consumed should be hygienic and free from all kinds of impurities. The Vedic people took much precaution of it. They desired for long and healthy life by utilizing healthy meal pure water. During the early historic period scholars of the then period not only made scientific study of the physical and chemical property of the water but discovered various causes for its impurities too. Further, the scientist like **Sushruta** and **Varahmihir** invented methods for the treatment of impure water. Besides some physical methods most of the treatment of unhygienic water were done by **herbal** and **medicinal plants**. In this paper all these have been discussed.

Since the beginning of life, one among the greatest concern associated with human health and hygiene has been the drinking water. It was desired to be good in taste, considerable in temperature and neat & clean in its appearance.

Water full of saps and good food is itself a purifying agent. Pure water is hygienic and necessary for mankind because it provides life and strength to them. Impure water causes weakness and diseases in human beings. Regular use of such water puts the life in danger. This was realized at the very early stage of historical period in India. That is why pure water is held sacred and auspicious drink by the Vedic people and often exhorted not to waste this water.¹ Modern science says that pure water is that form of water which consist Hydrogen and Oxygen (H₂O) in compound form.² Nothing else than these in this compound. But such water, which is a laboratory curiosity and rather a difficult task to prepare it. Pure water is characterized by specific feature of being soft, colourless, odorless and chemically neither acidic nor alkaline i.e. possessing the pH value 7.0.³

By the scientific study we come to know that pH is a unit of measurement that decides the degree of acidity or alkalinity of any solution (here water). It is one among several primary indicators of quality. Here 'p' stands for power and 'H' stands for chemical symbol for hydrogen and on the whole refers to the power or concentration of hydrogen ions in (atom) in water. pH values ranges between 0 to 14. 0 indicates the most acidic nature of a liquid substance with a high concentration of positive hydrogen ions H⁺ while 14 is indicative of most alkaline or basic nature, with a very high concentration of negative hydrogen ions OH⁻. A pH of 7.0 represents exact regularity of water 46⁰ F (8⁰ C) where the positive hydrogen ion atoms and negative hydroxyl ions are in equilibrium.⁴

The early period people were quite aware of the quality of the drinking water. In *Atharvaveda*⁵ it is desired that as “May the waters be pleasant to be our taste, be free from diseases, sickness be the remover of fear of death, be full of divine qualities and be the strength of eternal laws.” So, far as purest form of water is concerned, rain water has been considered to be of that level. It is most hygienic for drinking purpose.⁶ No doubt our hydrologists of early period were aware of such water and they named it ‘*Antariksham*’. While comparing it with other sources of water (on ground surface level), well water is considered to be comparatively better and pure and all these are due to the filter action of soil and sub-soil.⁷

Hymns invoking water and to its presiding deity **Varuna** reveal that Vedic people gave impetus on using water which is used to be free from all sort of impetus. They look proper care for an adequate supply of clean and hygienic water. The early Sanskrit literary compositions reveal that people during ancient period were so pertinent about using water for drinking and domestic purpose it had to be hygienically safe, reasonable soft, practically colourless and free for objectionable odor and taste.

So, far as reasons for impurities of water are concerned ‘*Sushruta*’⁸ has pointed out *ṣada doshas* i.e. six kinds of impurities.

- 1 *Sparsh dosh*
- 2 *Rupa dosh*
- 3 *Rasa dosh*
- 4 *Gandha dosh*
- 5 *Virya dosh*
- 6 *Vipaka dosh*

Further, *Sushruta* also mentions about ill effects caused by consumption of impure water. So to do away the impurities of water he prescribes some remedial substances like clearing nuts, *gomedaka*, lotus – bulbs, moss pearls, thick cloth, etc.

Tatra Saptakalsasya prasadhanani santi,

Tadyatha takagomedakabhi sagaranthi saivalamula vastrani muktamanisceti.

(Susrutasutra, 45.13)

Need of the Study

The study of water quality management during the ancient period is essential for understanding the foundations of sustainable water governance. Ancient civilizations such as the Indus Valley, Mesopotamia, Greece, and early Indian kingdoms developed sophisticated systems—including filtration, sedimentation tanks, and urban drainage—that reflect remarkable scientific wisdom. Examining these practices helps identify enduring principles relevant to modern water crises, such as community-based stewardship and eco-centric planning. This study is needed to trace historical continuity, highlight indigenous environmental knowledge, and support contemporary policy formulations grounded in time-tested strategies.

Scope of the Study

The scope of this study extends to exploring the technological, cultural, and administrative mechanisms of water quality management followed in ancient societies. It includes examining archaeological evidence, old texts such as Arthashastra, Manusmriti, and early Greek and Roman writings, and traditional engineering systems like stepwells, aqueducts, and natural filtration methods. The study covers both domestic and urban water management approaches, emphasizing preventive measures, purification techniques, and community participation. It also evaluates how these historical methods can be adapted or reinterpreted to improve present-day water conservation and quality regulation systems.

Literature Review

The age old purification process contains four major steps viz. storage coagulation filtration and disinfection.⁹ Storage was the simplest method for purification of water and for this water was simply stored in a jar and was allowed to rest. Thus the suspended particles of stored water used to settled down at the bottom of earthen vessel and the clear water lying in the upper portion was taken out and stored in another utensil. If needed it was boiled to improve the taste and quality otherwise it (purified through storage process) was considered fit for consumption.

Sometimes *Masur, jowar, potato, singhara*, drum stick were used as coagulants. More over some other particles for example seeds from *Nirmali* plant were sliced and rubbed around the sides of earthen pots or those were crushed to make a paste which was added to water. After stirring for some time alum was added to it. This method was applied to expedite the process of setting down the suspended particles in stored water. After due period of storage, as mentioned above the water used to be fit for consumption.

Another very simple method for purification of water was filtration done by a clean and thin cloth. The next method which is considered as sophisticated method was pot –filtration.¹⁰ It is in fact our age old traditional method. Three out of four pots having a small aperture at their bottom were put on the top of one another. The fourth one i.e. pot without aperture was kept at the lowest level. Pebbles, sand and charcoal were put in chronological order from top to bottom. The bottom or the fourth pot used to collect the filtered water trickling down from top to bottom.

Besides these, by rendering the fall of Sun rays, by dropping red hot iron-balls, sand, alum (a white mineral salt) and adding fragrances of flower in to the water were some other treatment measures which were in brought in practice for purification of water in ancient times. By letting the water heated by Sun-rays during day time and cooling during night (specially during moonlit night) water was made free from all effects of micro organism. In this heating and cooling process firstly water becomes free from bacteria (and other micro organisms) and secondly it becomes soft and light. Perhaps this may be the reason that traditional people still fetch water from rivers and lakes, during wee hours of the day.¹¹

Another method is known as *Pindavasa*¹² method. In this method a lump of earth mixed with *Phana, Mustaka, Ela, Usira and chandan* was nicely baked in the fire of *khadira* woods, and then it was provided into water. This alleviated all bad aliments. This may have been the first chemical process used for water treatment.

Some more methods which were used to remove all the *dosas* i.e. *Sparsa, Rupa, Rasa and Gandha dosas* were use of flowers and their powder. These were called as *Puspavasa* and *Curnadhivasa*.¹³

Varahamihir,¹⁴ the great scholar and scientist of Gupta period, has given some suggestive measures for making the water enable for human consumption. Firstly he mentions very

simple method which included boiling, filtration and use of alum etc. Boiling of water eliminates its turbidity and micro-organisms like bacteria.

Filtration, according to him should be done by means of fine- fiber cloth. Alum is applied for sedimentation of impure elements. For purifying the water of wells, tanks and reservoir Varahamihir recommends the application of mixture of *anjanam*, *musta*, *tubers*, *usira* powder of *rajakosalaka* *amalaka* and *kataka* nuts. By treatment of combination these substances to water which has become brackish, turbid, pungent or of bad taste, would turn clear, tasteful and obtain other good factors. All the above said plants of medicinal value are found through out the Indian peninsula.¹⁵

During ancient period to keep drinking water stored in tanks, some precautionary measures were taken by the people of early historical period. The study done in this field by C.P.Venkataraman Iyer¹⁶ throws some light on it. According to him during ancient period some particular type of trees were planted near the bunds of drinking water. These trees, which contained tannin in them, used to add slight sweet taste to the water. Besides this, it helped in clearing the impurities specially those present on the water surface, by carrying down all dirt and dust that the water contained. In this way the trees planted by them served same function which alum does. In addition to this the trees also provided shadow which kept water cool in summer.

In Dakargala chapter of *Brihatsanhita*¹⁷ too we find suggestive measures for storing the drinking water for longer duration. Here Varahamihir suggests that water should be stored in containers of earthen jar, coconut shell or copper pots. For taking out water from container, tubes should be applied. For maintaining the coolness of water for a little longer period *pugapatta* (bark of *Accacea arabeca*) should be wrapped around the container. In case of its unavailability wet cloth may be applied. The pot should be kept on moist containing sand and at clean place. The clean or filtered water stored in such vessels may be perfumed by adding essence of fruits and flowers. For sweetening it a piece of sugar candy may be dropped in to it.

Thus, we can say that the physical and chemical properties of water was thoroughly studied by the scholars and scientists in the early phase of Indian history. Impurities, undesirable substances, odor as well as dissolved matters etc. which have bearing on water to be consumed were eliminated by proper treatment. In a single sentence it may be said that- “ our people

in ancient period had great concern regarding drinkable water's taste, temperature, appearance and keeping it palatable for quite a longer duration”.

Limitations of the Study

This study is limited by the availability and reliability of ancient records, many of which are fragmentary or subject to interpretative variations. Archaeological findings often provide incomplete data, and many ancient purification techniques were undocumented or transmitted orally. Differences across regions and time periods also restrict the generalization of practices. Additionally, some ancient methods cannot be scientifically validated today due to lack of experimental evidence. These limitations create challenges in drawing precise conclusions; however, they do not diminish the value of the insights derived from historical environmental practices.

Findings of the Study

The study finds that ancient civilizations displayed a high degree of environmental awareness and scientific sophistication in managing water quality. Evidence from the Indus Valley indicates the use of well-planned drainage systems, soak pits, and covered sewers, reflecting strong urban sanitation practices. Ancient Indian texts mention boiling water, sand filtration, charcoal use, and copper vessels as natural disinfectants. Roman aqueducts, Greek cisterns, and Egyptian sedimentation basins highlight advanced hydrological engineering. The findings also show that water quality was not just a technical concern but a cultural and moral responsibility, as reflected in religious injunctions promoting purity and conservation.

The study further reveals that ancient strategies emphasized preventive care—protecting water sources from contamination, managing wastewater, and promoting community participation. Many of these principles align with modern sustainability frameworks such as integrated water resource management (IWRM). It is also found that the traditional knowledge systems were inherently eco-friendly, low-cost, and locally adaptable. Although not all methods are directly transferable, the underlying values of harmony with nature, decentralized management, and collective responsibility remain highly relevant. Overall, the findings suggest that ancient water governance provides a rich foundation for addressing contemporary water quality challenges.

This paper provides the message that -

A fundamental promise we must make to our people that the food we eat and the water we drink is safe.

Conclusion

The study of water quality management during the ancient period reveals that early societies possessed deep environmental wisdom and a holistic understanding of human health. Far from being primitive, their approaches to water purification, conservation, and assessment were rooted in careful observation, empirical knowledge, and a strong ethical framework regarding natural resources. Texts such as the *Atharvaveda* demonstrate that water was regarded not only as a physical necessity but also as a sacred element essential for spiritual and social well-being. Ancient scholars like Sushruta and Varāhamihira developed detailed classifications of water impurities and proposed effective treatment methods using natural materials, many of which align with principles of modern science. Their emphasis on sensory evaluation, pH-like observations, and natural filtration highlights a sophisticated early understanding of water chemistry and public hygiene.

These traditions underscore the importance of preserving ecological balance and ensuring communal responsibility toward clean water. Rainwater harvesting, soil-based filtration, and plant-based purification used in ancient times are increasingly relevant today in the face of groundwater depletion, pollution, and climate-induced water stress. By revisiting these longstanding practices, contemporary water governance can integrate traditional ecological knowledge with scientific advancements to develop sustainable, low-cost, and culturally grounded solutions. Thus, ancient water management systems serve as valuable models that inspire modern strategies for safeguarding water quality and ensuring long-term public health.

References

1. Agarwal, A., & Narain, S. (1997). Dying wisdom: Rise, fall and potential of India's traditional water harvesting systems. Centre for Science and Environment.
2. *Atharvaveda* translated by Whitney, Vol.-I, 1,4,5,6
3. *Brihatsanhiata*, Dakargala adhyaya, Chaukhambh Vidya Bhawan, p.21
4. Bryant, E. F. (2001). *The Vedas: Texts, language and ritual*. Oxford University Press.

5. Cech, Thomas V. 2003 *Principles of Water Resources*, John Wiley & Company, Inc., p.305
6. Chakrabarti, D. K. (1995). *The archaeology of ancient Indian cities*. Oxford University Press.
7. Chandra, S. (2007). *Water management in ancient India: Archaeological and literary perspectives*. *Journal of History and Social Sciences*, 8(2), 45–60.
8. Gadgil, M., & Guha, R. (1993). *This fissured land: An ecological history of India*. Oxford University Press.
9. *Ibid*
10. Krishnamurthy, Radha 1996 *Water in ancient India*, *Indian Journal Of History of Science*, N. Delhi, p308
11. Pandey, G. N. (2005). *Environmental management: Vedic and medieval perspectives*. Concept Publishing.
12. Paranjapey, Vjijay 2006 *Water Management concept in classical Indian Literatuare*, (edts) K.K.Chakravarti *et.al.*, *Traditional Water Management System of India*, p-67
13. Sharma, R. S. (1990). *Material culture and social formations in ancient India*. Macmillan.
14. Singh, R. L. (2010). *Traditional water purification systems in early Indian civilization*. *Indian Journal of Environmental History*, 12(1), 21–34.
15. Venkatraman Iyer, CP 1916, *Town Planning in ancient Deccan*; T.M.Srinivasan 1997 *Irrigation and Irrigation works in India*, (ed.) A.K. Bag *History of Technology in India*, Indian National Science Academy, N. Delhi, p. 578-574