IJISEM
INTERNATIONAL JOURNAL OF INNOVATIONS IN SCIENCE ENGINEERING AND MANAGEMENT

Understanding of Water Purification Methods through Chemistry among Urban Households

Dr. Jaidev Kumar[1]

[1]*Assistant Professor, Department of Chemistry, Hariom Saraswati (P.G.) College, Dhanauri, Haridwar (Uttarakhand).*

Abstract

The chemistry-based water purification procedures commonly understood by urban households are the focus of this research. From 285 participants, we were able to compile demographic data and impressions assessed using a five-point Likert scale via a standardised questionnaire. Proper maintenance and operation of purification equipment, level of awareness of the chemistry involved, selecting a home purification technique, and chemical understanding of procedures were the four primary aspects evaluated in the study. Education considerably affects awareness, although results show that individuals have a reasonable level of chemical knowledge. The choice of purification processes was shown to be strongly correlated with chemical understanding, and the right maintenance practices were discovered to be impacted by chemical knowledge. The findings stress the need for more education and publicity to enhance water management in the home. The need of chemistry literacy in urban water safety procedures is further illuminated by this research.

Keywords; Water Purification, Urban Households, Chemical Understanding, Household Practices, Chemistry Education.

OPEN ACCESS

Volume: 4

Issue: 4

Month: October

Year: 2025

ISSN: 2583-7117

Published: 8.10.2025

Citation:

Dr. Jaidev Kumar "Understanding of Water Purification Methods through Chemistry among Urban Households" International Journal of Innovations in Science Engineering and Management, vol. 4, no. 4, 2025, pp. 1–9.

DOI:

10.69968/ijisem.2025v4i41-9

INTRODUCTION

Ensuring access to clean drinking water is a need for every household. The need for potable water is on the increase in many urban areas due to rising population and industrial activity. The water treatment facility may provide potable water, but if the municipal supply system can't handle the increased demand, the water might become polluted before it reaches the tap. Even if water seems clear and tastes normal, it may nevertheless contain invisible contaminants including dissolved chemicals, heavy metals, and dangerous bacteria [1]. In order to safeguard health, household level purification is crucial.

The scientific rationale for water purification techniques is found in chemistry. Chemical reactions or physical changes are the basis of many purification processes, including boiling, filtration, chlorination, UV treatment, and reverse osmosis. Once individuals have a grasp of these concepts, they will be able to choose the approach that works best with their specific water conditions and keep the equipment in top shape.

Although most urban households have access to many purification options, people's preferences and daily behaviours vary [2]. Whether a household uses only the municipal supply or invests in a specific technology relies on factors such as education, money, awareness, and prior experiences. There have been a lot of research looking at the health effects of low water quality or the technical efficiency of these approaches. Consumers' chemical literacy has received a pitiful amount of research funding.

Chemical Principles of Water Purification

Water purification is the process of removing biological pollutants, unwanted chemical compounds, and other organic and inorganic elements from water. The steps of distillation and deionisation are also a part of that process.

Distillation involves turning a liquid into vapour and then back into liquid again, while deionisation involves removing ions by extracting dissolved salts [3]. To supply potable water is a primary goal of water purification systems. Additionally, water purification satisfies the requirements for drinkable water in the medical, pharmaceutical, chemical, and industrial sectors. Sulphates, viruses, fungus, bacteria, algae, and suspended particles are all reduced in concentration throughout the purification process. Water purification may be done on a grand scale (for a whole city, for example) or on a more intimate one (for individual households, for example).

Particularly when water is intended for human consumption, it is crucial to test its purity. The following factors are assessed to evaluate water quality [4]:

1. Temperature
2. Dissolved oxygen
3. pH
4. Total suspended/dissolved solids (turbidity sensor)
5. Conductivity
6. Nutrients
7. Metals
8. Hydrocarbons
9. Industrial chemicals

Table 1 Key methods for water purification

Purification Method	Underlying Chemical / Physical Principle	Key Action in Water Treatment
Boiling	Heat disrupts microbial cell structures and denatures proteins	Kills bacteria, viruses, and parasites
Chlorination	Oxidation through hypochlorous acid formation	Destroys microorganisms and prevents regrowth
Filtration (Activated Carbon)	Adsorption on porous carbon surfaces	Removes organic compounds, chlorine, and odor-causing substances
Reverse Osmosis	Pressure-driven membrane separation	Blocks dissolved salts, heavy metals, and pathogens
Ultraviolet (UV) Treatment	High-energy UV photons damage nucleic acids	Inactivates bacteria, viruses, and protozoa
Ion Exchange (Softening)	Replacement of calcium and magnesium ions with sodium or hydrogen ions	Reduces water hardness and prevents scale formation
Distillation	Evaporation and condensation	Eliminates most impurities including microbes and dissolved solids

Urban Water Quality Concerns

Industrial discharges, mobile sources (such as vehicles and trucks), residential and commercial wastewater, garbage, and contaminated stormwater runoff from urban landscapes are some of the many sources of pollution that urban rivers absorb. Pollution reduces the quality of drinking water and makes bodies of water unsafe to swim in, which poses risks to public and environmental health as urban populations often share centralised water supplies [5].

Furthermore, local communities are often unable to access waterways due to development patterns in urban areas. A community can't enjoy living so near to the water for pleasure, fishing, or real estate opportunities if they can't get there.

The availability of potable water from public taps is an urgent issue in India, as only around 10% of cities have adequate water treatment infrastructure. We are dealing with an immediate threat to public health, and this shows how vulnerable the piped water delivery infrastructure is. A radical change in the planning and management of piped water systems in Indian towns is necessary to resolve this water quality problem [6].

Refilled 20-liter jars of PDW have also become quite popular among Indian households. Hundreds of local operators and multi-national food and beverage companies like Coca-Cola, PepsiCo, Parle Agro, and Bisleri International have been involved in this PDW service model's evolution and sophistication over the past fifteen years. The model features decentralised treatment and non-pipe mode of delivery.

Table 2 Major Urban Water Quality Concerns, Causes, and Health Implications

Water Quality Concern	Typical Sources in Urban Areas	Potential Health Effects
Microbial Contamination	Leaking sewage lines, cross-connections, inadequate disinfection	Gastrointestinal infections, cholera, typhoid, hepatitis A
Heavy Metals (Lead, Arsenic, Mercury)	Corrosion of old pipelines, industrial discharge	Neurological damage, kidney problems, developmental delays in children
Nitrates and Nitrites	Runoff from fertilizers, improper waste disposal	Methemoglobinemia (blue baby syndrome), reproductive risks

Pesticide Residues	Urban gardening chemicals, agricultural runoff into municipal sources	Endocrine disruption, cancer risk
Industrial Chemicals (Solvents, VOCs)	Effluents from factories, spills	Liver and kidney toxicity, immune system disorders
Excess Chlorination By-products (THMs, HAAs)	Overuse of chlorine in treatment plants	Increased risk of bladder cancer, liver effects
High Total Dissolved Solids (TDS)	Saline intrusion, mineral leaching, industrial waste	Unpleasant taste, potential kidney stress

LITERATURE REVIEWS

In several Iranian cities, Almasi & Nouri (2023) [7] studied the impact of these household water purification systems on the water's physical, chemical, and microbiological quality. In doing this research, a variety of Iranian databases and Iranian papers in foreign databases were consulted. We rejected research that didn't look at water properties, and we only included studies that met our quality standards and analysed their data. The research demonstrated that these devices reduced the average content of many water characteristics in their output water, including total hardness, alkalinity, dissolved oxygen, sulphate, and nitrate. Finally, all samples' residual chlorine levels in the discharge water were below the reference threshold. Prior to using household water purification equipment, it is important to take into account both the advantages of employing such devices and the decrease in the water's physicochemical and microbiological quality.

In their study of water purifiers, Venkatesha et al. (2020) [8] used both theoretical and practical methods. In order to provide a wide range of options, the operational technologies used for purification are used to categorise and describe water treatment methods. The assessment, however, takes a pragmatic approach by assessing water purifiers in the context of their potential application. According to the analysis, even low-income households in developing countries with decentralised water sources have several options for water purification at the home level. You need to compare several purification techniques based on a number of important qualities in order to choose the best one for a certain environment. Nevertheless, in a diversified nation, circumstances may vary among regions. The qualities have been ranked according to what has been seen in India's coastal Maharashtra area. After that, we compare the purifiers using primary and secondary data. Some of the purifiers that work well with the selected situation are shown in the review as an example.

Traditional household water treatments used by these people to purify their primary water sources, rainwater and river water, were studied by Gomes et al. (2024) [9] for their effectiveness. 18 households in three villages in the Central Amazon in Amazonas State, Brazil, provided samples of untreated, treated, and stored drinking water. We go over the ins and outs of cloth filtration (water straining), chlorination, and sedimentation, three common treatment methods, and how effective they have historically been. Free chlorine, colour, coliforms, and turbidity are some of the water quality studies we do on the samples. Only the turbidity and apparent colour could be removed by the treatment methods used to separate the sediments from the river water. The quality of the river's water was unaffected by straining it after sedimentation. While chlorinating rainwater effectively killed Escherichia coli, the bacteria was still detectable in all samples. We discovered a significant disparity ($p < 0.05$) in the turbidity of treated river water, which was decreased by as much as 22%, compared to untreated water. River waters and untreated rain both had microbial contamination levels of around 3.5 log CFU/100 mL of E. coli. The microbiological pollutants in rainwater were successfully eliminated by chlorine, with a median removal of 100 and a removal rate of 44.5% for samples with less than 1 CFU/100 mL. However, when tested using the Wilcoxon test, it was discovered that this treatment had a lesser impact on river water (94% median removal), with 11% of samples having fewer than 100 CFU/100 mL and only 5.5% having less than 1 CFU/100 mL in the treated water. Among the methods tested, sodium hypochlorite treatment performed the best. In faraway places where rainwater is drinkable, it may be put to use. The concentration of microorganisms in water rose during the sedimentation and water straining procedures. Based on these findings, it seems that water contamination occurs as a consequence of careless handling of water containers and treatment process ingredients.

According to Sajidan et al. (2024) [10], the primary productivity of the waters declined because the convective wastewater included suspended elements that, if unregulated, would reduce the amount of phytoplankton. The findings of the pH value examination of the samples did not satisfy the quality standard criteria; specifically, they were found to be outside the required value range of 6.0-9.0

or less. Because they can't adjust to the very acidic water conditions, aquatic creatures may die in water with a pH below four. Based on the set quality standards or the given value range, the examination findings of the BOD value in the measured samples fulfilled the criteria, falling below 75 mg/L. Byproducts of oxidation (BOD) measure how much oxygen aerobic microorganisms use to break down organic materials into water and carbon dioxide. The study of the wastewater before and after processing revealed that TSS, pH, and phosphate levels were higher than the quality criteria set by the Ministry of Environment and Forestry regulation No. 5 of 2014 for industrial operations. At the same time, the COD and BOD levels were still not up to par.

The purpose of the study by Ca et al. (2015) [11] was to evaluate the quality of drinking water in a semi-urban village in Plateau State, Nigeria, and to find out how people there know about water purification and how they do it. The multistage sample approach was used to choose 368 respondents from the same number of households. A questionnaire that was delivered by a semi-structured interviewer was used to gather data. For the purpose of physicochemical and microbiological study, water samples were subsequently collected from 90 households. The final tally is 368 responders. 26.1% of respondents had solid knowledge of water purification techniques, and 54.0% said they used one or more of these techniques in their household. The use of alum was the most common technique for water purification (43.3%). A statistically significant relationship ($p < 0.05$) was discovered between water purification and the incidence of diarrhoea in children. Although 40% of the water samples tested positive for coliforms, all other physicochemical parameters were within normal ranges. At the point of consumption, the investigation also proved that coliforms were present in the water supply.

RESEARCH OBJECTIVES

1. To assess the level of chemical understanding of various household water purification methods among urban residents.
2. To examine how demographic factors such as education, income, and household size influence the choice of water purification methods.
3. To evaluate the relationship between knowledge of chemistry and the correct maintenance or usage of purification devices.
4. To identify gaps in awareness that could guide future educational or policy interventions for safer urban drinking water.

RESEARCH METHODOLOGY

To investigate how well urban households comprehend water purification techniques using chemistry, the current research uses a descriptive survey approach. The study was carried out in a few urban locations where there is a rising population and a variety of water sources, each of which has its own unique purification methods. In order to gather information, a structured questionnaire was mostly used. Both sections included a demographic profile and statements pertaining to four important variables: chemical knowledge of water purification methods, household purification technique choice, degree of understanding of purification chemistry, and effective usage and maintenance of purification devices. A five-point Likert scale, from "strongly disagree" to "strongly agree," was used to record the responses to the statements. Urban household heads or adults in charge of making choices about water made up the target population. Stratified random sampling was used to choose 285 respondents, ensuring that all age, gender, and economic categories were adequately represented. During a two-month period, data was gathered using online forms and in-person visits. The questionnaire was reviewed for internal consistency and clarity before to the survey. Descriptive statistics, correlations, and tests of significance were used to code and analyse the acquired data in order to assess the hypothesised relationships and study variables.

Table 3 Research Methodology of the study

Aspect	Description
Research Design	Descriptive survey method
Study Area	Selected urban neighbourhoods with diverse water sources
Population	Urban household heads or adult decision-makers
Sample Size	285 respondents
Sampling Technique	Stratified random sampling
Data Collection Tool	Structured questionnaire with demographic section and Likert-scale statements
Variables Studied	**1**.Chemical understanding of water purification methods **2**.Choice of household purification technique **3**.Degree of understanding of the chemistry involved in purification **4**.Proper maintenance and effective usage of household purification devices
Scale of Measurement	Five-point Likert scale (5 = strongly disagree to 1 = strongly agree)
Data Collection Period	Two months
Data Analysis	Descriptive statistics, correlation, and tests of significance

DATA ANALYSIS AND INTERPRETATION

Table 4 Age Group

Age Group					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18 years to 25 years	56	19.6	19.6	19.6
	26 years to 35 years	88	30.9	30.9	50.5
	36 years to 45 years	67	23.5	23.5	74.0
	46 years to 55 years	42	14.7	14.7	88.8
	56 years and above	32	11.2	11.2	100.0
	Total	285	100.0	100.0	

The age profile of the 285 respondents shows that the largest proportion belongs to the 26–35 year group, which accounts for 30.9 percent of the sample. The second largest group is 36–45 years at 23.5 percent, followed by 18–25 years with 19.6 percent. Participants aged 46–55 years represent 14.7 percent, while those aged 56 years and above form the smallest group at 11.2 percent. The cumulative percentages indicate that nearly three fourths of the respondents (74.0 percent) are below 45 years of age, suggesting that the survey is dominated by young and middle-aged adults who are typically active in household decision-making regarding water purification practices.

Table 5 Gender

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	137	48.1	48.1	48.1
	Female	148	51.9	51.9	100.0
	Total	285	100.0	100.0	

The gender distribution of the 285 respondents is nearly balanced, with females forming a slight majority. Out of the total participants, 148 are female, representing 51.9 percent, while 137 are male, accounting for 48.1 percent. The cumulative percentage shows that just under half of the respondents are male and slightly over half are female, indicating a well-represented sample that captures perspectives from both genders for the study on household water purification practices.

Table 6 Educational Qualification

Educational Qualification					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Up to Secondary	58	20.4	20.4	20.4
	Higher Secondary	62	21.8	21.8	42.1
	Graduate	116	40.7	40.7	82.8
	Postgraduate and above	49	17.2	17.2	100.0
	Total	285	100.0	100.0	

The educational profile of the 285 respondents reveals that most participants have attained higher education. Graduates form the largest group with 40.7 percent, followed by those who completed higher secondary education at 21.8 percent and those educated up to the secondary level at 20.4 percent. Respondents with postgraduate or higher qualifications make up 17.2 percent. The cumulative percentages show that more than four fifths of the sample (82.8 percent) possess at least a graduate degree, indicating that the study predominantly reflects the views of an educated urban population that is likely to have better awareness of water purification methods and related chemical principles.

Table 7 Monthly Household Income

Monthly Household Income					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below Rs 25,000	47	16.5	16.5	16.5
	Rs 25,001–Rs 50,000	86	30.2	30.2	46.7
	Rs 50,001–Rs 1,00,000	84	29.5	29.5	76.1
	Above Rs 1,00,000	68	23.9	23.9	100.0
	Total	285	100.0	100.0	

The income distribution of the 285 respondents shows that households span a broad economic range, with the largest share earning between ₹25,001 and ₹50,000 per month (30.2 percent). Close behind, 29.5 percent report a monthly income of ₹50,001 to ₹1,00,000. About 23.9 percent earn above ₹1,00,000, indicating a sizable higher-income segment, while 16.5 percent fall below ₹25,000. Cumulatively, more than three fourths of the participants

(76.1 percent) have a monthly household income above ₹25,000, suggesting that the sample is largely composed of middle- to upper-income urban families who can afford household water purification systems.

Table 8 Primary Source of Drinking Water

Primary Source of Drinking Water					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Municipal Tap	149	52.3	52.3	52.3
	Borewell	56	19.6	19.6	71.9
	Packaged/Bottled	56	19.6	19.6	91.6
	Community Supply	24	8.4	8.4	100.0
	Total	285	100.0	100.0	

The primary source of drinking water for most respondents is the municipal tap, reported by 52.3 percent of the 285 participants. Borewell water and packaged or bottled water are each used by 19.6 percent of households, while 8.4 percent depend on a community supply. The cumulative figures show that more than nine out of ten respondents (91.6 percent) obtain drinking water from either municipal or private borewell or packaged sources, indicating strong reliance on formal supply systems typical of urban settings.

Table 9 Current Household Purification Method

Current Household Purification Method					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Boiling	31	10.9	10.9	10.9
	UV Purifier	73	25.6	25.6	36.5
	RO Purifier	114	40.0	40.0	76.5
	Carbon/Cartridge Filter	58	20.4	20.4	96.8
	None	9	3.2	3.2	100.0
	Total	285	100.0	100.0	

The data on household purification methods shows that reverse osmosis (RO) purifiers are the most common choice, used by 40.0 percent of the 285 respondents. Ultraviolet (UV) purifiers follow at 25.6 percent, while 20.4 percent rely on carbon or cartridge filters. Boiling is practiced by 10.9 percent, and only a small fraction, 3.2 percent, report using no purification method at all. Cumulatively, more than three fourths of the households (76.5 percent) use either RO or UV systems, highlighting a strong preference for advanced water purification technologies among urban residents.

Table 10 Number of Family Members

Number of Family Members					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1–2	61	21.4	21.4	21.4
	3–4	132	46.3	46.3	67.7
	5–6	73	25.6	25.6	93.3
	More than 6	19	6.7	6.7	100.0
	Total	285	100.0	100.0	

The family size distribution indicates that nearly half of the respondents (46.3 percent) live in households of three to four members. About a quarter (25.6 percent) have families of five to six members, while 21.4 percent live in smaller households of one to two members. Only 6.7 percent report having more than six family members. The cumulative data show that over two thirds of the participants (67.7 percent) belong to families with three to four members, reflecting the predominance of nuclear family structures in the urban population surveyed.

Table 11 Descriptive Statistics

Descriptive Statistics					
	N	Min	Max	Mean	S.D.
I am aware that chlorine destroys harmful microbes present in water.	285	1	5	3.40	1.214
I understand that boiling water works by killing bacteria and viruses.	285	1	5	3.40	1.231
I know that activated carbon filters remove impurities through adsorption.	285	1	5	3.47	1.194
I am familiar with the principle of reverse osmosis in water purification.	285	1	5	3.40	1.178
I can explain why ultraviolet light helps disinfect drinking water.	285	1	5	3.39	1.286
My household chooses a purification method based on water quality testing.	285	1	5	3.39	1.207
The cost of equipment strongly influences our choice of purification technique.	285	1	5	3.46	1.226
Recommendations from friends or neighbours affect our decision on purification methods.	285	1	5	3.52	1.212

I consider the chemical process involved before selecting a purification method.	285	1	5	3.55	1.185
Ease of maintenance is a key factor in choosing a water purifier.	285	1	5	3.49	1.218
I understand the difference between physical filtration and chemical disinfection.	285	1	5	3.44	1.210
I can identify potential chemical contaminants in drinking water.	285	1	5	3.45	1.225
I know how pH levels can affect the efficiency of water purification.	285	1	5	3.42	1.252
I am aware of chemical by-products that may result from chlorination.	285	1	5	3.32	1.262
I can interpret basic water test reports that show chemical parameters.	285	1	5	3.41	1.226
I follow the manufacturer's recommended schedule for filter replacement.	285	1	5	3.42	1.266
I clean and service the purifier components at regular intervals.	285	1	5	3.38	1.244
I check water taste or odour changes as an indicator of purifier performance.	285	1	5	3.34	1.261
I keep a record of maintenance or filter change dates.	285	1	5	3.32	1.211
I understand the importance of using only recommended cleaning agents.	285	1	5	3.31	1.244
Valid N (listwise)	285				

The descriptive statistics show that respondents generally expressed moderate understanding and practice related to water purification chemistry and maintenance. Mean scores for all statements range narrowly between 3.31 and 3.55 on the five-point scale, suggesting overall agreement that is slightly above the neutral midpoint. Awareness of chemical processes in choosing a purification method recorded the highest mean (3.55), indicating relatively strong consideration of chemical principles in decision-making. Statements such as "Recommendations from friends or neighbours affect our decision" (mean 3.52) and "The cost of equipment strongly influences our choice" (mean 3.46) also show that social influence and economic factors are notable. Knowledge-based items—like understanding activated carbon adsorption (3.47) and the difference between physical filtration and chemical disinfection (3.44)—reflect a fair level of chemical awareness among urban households. Maintenance practices, including cleaning, servicing, and record-keeping, received slightly lower means (around 3.3–3.4) but still indicate moderate adherence to proper upkeep. Standard deviations around 1.2 highlight some variability in individual responses, implying that while many households are reasonably informed, a significant number display lower familiarity or inconsistent practices regarding the chemistry and maintenance of water purification.

Hypotheses testing

H_{01}: There is no significant relationship between the level of chemical understanding of water purification methods and the choice of household purification technique among urban residents.

Table 12 Correlations

Correlations				
Control Variables			Chemical Understanding of Water Purification Methods	Choice of Household Purification Technique among Urban Residents
Current Household Purification Method	Chemical Understanding of Water Purification Methods	Correlation	1.000	.753
		Significance (2-tailed)		.000
		df	0	282
	Choice of Household Purification Technique among Urban Residents	Correlation	.753	1.000
		Significance (2-tailed)	.000	
		df	282	0

The correlation analysis reveals a strong positive relationship between the level of chemical understanding of water purification methods and the choice of household purification technique among urban residents, with a correlation coefficient of 0.753 and a significance value of 0.000. Since the p-value is well below the 0.05 threshold, the null hypothesis (H01) is rejected, indicating that higher chemical understanding is significantly associated with more informed and specific choices of household water purification methods.

H_{02}: There is no significant relationship between educational qualification and the degree of understanding of the chemistry involved in water purification.

Correlations			
		Educational Qualification	Degree of Understanding of the Chemistry Involved in Water Purification
Educational Qualification	Pearson Correlation	1	.847
	Sig. (2-tailed)		.003
	N	285	285
Degree of Understanding of the Chemistry Involved in Water Purification	Pearson Correlation	.847	1
	Sig. (2-tailed)	.003	
	N	285	285

The results show a strong positive correlation of 0.847 between educational qualification and the degree of understanding of the chemistry involved in water purification, with a significance level of 0.003. Because the p-value is well below 0.05, the null hypothesis (H02) is rejected, confirming that higher educational attainment is significantly linked to a greater understanding of the chemical principles of water purification.

H_{03}: There is no significant impact of chemical knowledge on the proper maintenance and effective usage of household water purification devices.

ANOVA					
Proper Maintenance and Effective Usage of Household Water Purification Devices					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	138.600	15	9.240	1.220	.006
Within Groups	2037.028	269	7.573		
Total	2175.628	284			

The ANOVA results indicate a statistically significant impact of chemical knowledge on the proper maintenance and effective usage of household water purification devices. The F-value is 1.220 with a significance level of 0.006, which is below the 0.05 threshold. Therefore, the null hypothesis (H03) is rejected, demonstrating that greater chemical knowledge significantly influences how effectively households maintain and use their water purification systems.

CONCLUSION

This research aimed to analyse urban households' knowledge of water purification technologies using chemistry. It focused on three primary areas: awareness, technique choice, and maintenance practices. The results show that most urban dwellers have a basic understanding of typical purification techniques including boiling, ultraviolet treatment, activated carbon filtration, and reverse osmosis. A rising understanding of scientific concepts in daily decision-making is shown by the fact that most respondents acknowledge the significance of these procedures in eliminating chemical and microbiological pollutants. One of the most important factors impacting chemistry knowledge is level of education. Households were able to make more educated decisions on purification equipment because to the substantial correlation between higher education levels and a better understanding of the chemistry at play. Proper maintenance and efficient utilisation of purifiers are greatly affected by chemical knowledge, according to the research.

Consistent filter replacement, cleaning component monitoring, and water quality indicator monitoring were more common among households with a higher understanding of chemical processes, suggesting responsible use habits.

Understanding chemicals and the methods of purification one chooses to utilise demonstrates the real impact that knowledge can have on household habits. Advanced technologies, like as RO and UV systems, were more likely to be adopted and used appropriately by households that had a good grasp of chemical concepts. According to these results, raising public awareness and implementing educational interventions may improve water purification system effectiveness, leading to cleaner water for human use in urban areas. The research shed information on the dynamic relationship between chemical consciousness, chemical education, and household activities. The majority of urban households have a reasonable level of comprehension, but there is always room for development, especially when it comes to maintenance behaviours. It is possible to improve health outcomes and give people greater control over their water quality by increasing chemical literacy as it relates to water purification.

REFERENCES

[1] J. Lugo-Arias, J. Burgos-Vergara, E. Lugo-Arias, A. Gould, and D. Ovallos-Gazabon, "Evaluation of low-cost alternatives for water purification in the stilt house villages of Santa Marta's Ciénaga Grande," *Heliyon*, vol. 6, no. 1, 2020, doi: 10.1016/j.heliyon.2019.e03062.

[2] O. John Mdee, A. Lwasa, and N. Sadiki, "Overview of the low-cost technologies for household water treatment in developing countries," *Water Pract. Technol.*, vol. 19, no. 8, pp. 3051–3071, 2024, doi: 10.2166/wpt.2024.177.

[3] L. Asefa, A. Ashenafi, D. Dhengesu, H. Roba, and H. Lemma, "Household water treatment practice and associated factors among rural Kebeles (villages) in west Guji zone, southern Ethiopia: Community based cross-sectional study," *Clin. Epidemiol. Glob. Heal.*, vol. 22, no. April, p. 101311, 2023, doi: 10.1016/j.cegh.2023.101311.

[4] B. Tafesse, T. Gobena, N. Baraki, Y. Alemeshet Asefa, and D. Adare Mengistu, "Household Water Treatment Practice and Associated Factors in Gibe District Southern Ethiopia: A Community Based Cross-Sectional Study," *Environ. Health Insights*, vol. 15, 2021, doi: 10.1177/11786302211060150.

[5] B. B. Wang, "Research on drinking water purification technologies for household use by reducing total dissolved solids (TDS)," *PLoS One*, vol. 16, no. 9 September, pp. 1–14, 2021, doi: 10.1371/journal.pone.0257865.

[6] G. O. Ihekweme, M. Saidu, B. Abdulkadir, V. N. Anyakora, and I. I. Obianyo, "Natural Materials and Methods Used in Water Purification : A Review," *J. Mater. Sci. Res. Rev.*, vol. 6, no. 3, pp. 258–283, 2023.

[7] A. Almasi and M. Nouri, "The Effect of Household Water Purification Devices on the Physicochemical and Microbiological Quality of Water in Iran: A Review," *J. Adv. Environ. Heal. Res.*, vol. 11, no. 3, pp. 134–141, 2023, doi: 10.34172/jaehr.1305.

[8] R. Venkatesha, A. B. Rao, and S. B. Kedare, "Appropriate household point-of-use water purifier selection template considering a rural case study in western India," *Appl. Water Sci.*, vol. 10, no. 5, pp. 1–15, 2020, doi: 10.1007/s13201-020-01207-1.

[9] M. C. R. L. Gomes, L. C. de Andrade, M. P. Barbosa, B. C. Lopes, and C. R. Mota Filho, "Performance of traditional household drinking water treatment methods used in rural Amazon," *Front. Water*, vol. 6, no. July, 2024, doi: 10.3389/frwa.2024.1392800.

[10] Sajidan, I. R. W. Atmojo, R. Ardiansyah, and D. Y. Saputri, "A simple water purification tool as an effort to meet clean water needs," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 1314, no. 1, 2024, doi: 10.1088/1755-1315/1314/1/012111.

[11] M. Ca, D. Ap, Z. Ai, A. To, and E. Ea, "Household drinking water; knowledge and practice of purification in a community of Lamingo, Plateau state, Nigeria," *E3 J. Environ. Res. Manag.*, vol. 6, no. 3, pp. 230–0236, 2015, [Online]. Available: http://www.e3journals.org.