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# Knowledge and Practice on Water Quality Management and Water-Borne Diseases in Kathmandu, Nepal

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**Abstract**

The present study evaluated the knowledge and practices of people related to water quality and water borne disease in different area of Kathmandu district. Simple random method was used to select households for interview based on structured questionnaire. Further detail data obtained from observation, checklist and pilot survey in water suppliers including Kathmandu Upatyaka Khanepani Limited. Altogether 153 (91 female & 62 female) people in 153 household and 25 water suppliers including KUKL, community water suppliers and private water suppliers were interviewed and ten focus groups discussion were organized with water manager. Collected data were analyzed using MS-Excel 2011. From the analysis, almost of the respondent (91%) replied for their dependency upon water suppliers for water quality and only few (9%) respondents applied laboratory tests for their water quality. The most common source of information for water quality management was television followed by peer group communication and least considered source of information was NGOs and CBOs. Similarly, mostly used treatment practice for water quality improvement was filtration followed by boiling and least used method was treatment plant. Altogether four categorical responses known for water borne disease where rare number of respondents were actively following prevention to be safe from water borne diseases. Knowledge and practice on water quality, and water-borne diseases, among respondent of study area were unsatisfactory. So, the awareness programs regarding water purification, water pollution, storage, and water borne diseases should be carried on a regular basis. The responsible authority should make laws against the water pollution, water storage and distribution that minimize the future consequences of water borne disease.

***Keywords*:** Disease, Sundari Jal, KUKL, Knowledge, KAP, Water

## Introduction

Water is the most abundant and renewable natural resource on the earth, which covers 70% of earth surface in which just 2.5%, is fresh water and 97.5% salt water (Mishra, 2023). About 68.7% of fresh water is in the form of glaciers mass, 30.1% water below the ground & 0.9% avaiable other forms, and the remaining just 0.3% is available on the surface (Spring, 2019). Among the surface water, 87% of water is in lakes, 11% is in swamps and only 2% is in river systems. A small portion (about 2.0%) of Earth's water is considered as fresh and suitable for human consumption (Mishra, 2023). Around, 13% of this portion is groundwater which is a vital source of drinking water for human consumpation worldwide (Bindhu and Selvamohan, 2009). The quality of fresh water resoureces are decreasing that cause severe scarcity of suitable quality of drinking water. The deficiency of safe drinking water in a South Asian region significantly

affects its socioeconomic development (Gajendran, 2011). Water is the most imperative natural resource in the world, which has specific importance for a country's economic development and it plays a crucial role in human lives.

Nepal is richest country in water sources having approximately 6000 rivers and rivulets outflow with a total catchment area of 194,471Km$^2$ (WECS, 1994; 2005; 2011) and there are around 5000 natural lakes, 5183 ponds and 1380 reservoirs also crucial sources of water (DOAD,1992). However, difficult ecological structure and the least developed nature of the country, water sources are not conserved and maintained properly. Surface and groundwater are contaminated and not suitable for drinking purposes. So, Nepal considered as in top five for poor drinking water supply (McPhillips, 2017). Kathmandu is a valley situated in the mid-hilly region of Nepal. It is one of the fastest-growing towns and metropolitan cities. The main source of water is the non-snow-fed river Bagmati originated from the Shivapuri range of the southern part of the Mahabharat Mountains (Shrestha, 2009). The Bagmati River arises at Baghdwar and drains out through the Chobhar Gorge (Giri. et. al., 2022). One of the basic needs of humanbeing is safe drinking for healthy life. According the report of world health rganization's 1.1 billion people has insufficient access to clean drinking water, in which almost two-thirds population from Asia (WHO,2006). Due to insufficient access of safe drinking water, thousands of pepole die every year from preventable water-borne diseases (AusAID, 2003). Lack of insufficient clean drinking water and poor sanitation are the main cause of global poverty which boost the cycle of poverty that slow the growth and devolpment of society. The insufficient availability of safe water cause health problem among the people especially in chlideren that reduced the growth and life span sometimes, occur death (Havelaar & Melse, 2003).

It has estimated that poor hygiene, sanitation, and unsafe water supply are the major responsible cause for diarrheal illness cases, which cause death more than millions of people annually (WHO,2006). The overpopulation, urbanization, and climate change decreses the resources of water therefore water resoureces became limited in the different part of the world (Jackson et.al., 2001). The term "drinking water quality" refers to the relationship between the natural processes and human actions that affect water composition. Chemical compounds are introduced into the water supply system through leaks and cross-connections, which results in a decline in the quality of drinking water (WHO,2014). Safe drinking water for all is a global concern, however, most of the people are still relying on unprotected water resources including rivers, streams, springs, pumps, and wells which are highly susceptible to flood, and other biological contmainations (Messeret, 2012).

The major sources of pollution in water resources are anthropogenic activities that mixing physical or chemical wates directly into the water body (Aremu et.al., 2011). These chemical waste disposals in water body is responsible for several water borne diseaee and their transmission. Also, the poor traditional practice of open field defecation is another reason for water contamination (Messeret, 2012). Inadequate sanitation, polluted water, or unavailability of water are the major cause for majority (80%) of all sicknesses and diseases in the world (WHO, 1997). This study has attempted to find out the status of knowledge and practice of water quality management and water-borne diseases Kathmandu, Nepal.

## Material and Methods

### Study Area

Altogether 153 households from eighteen study sites (Sundarijal, Mahankalchor, Kapan, Chabahil, Boudha, Shankhapark, Sukedhara, Dhumbarahi, Gaushala, Mitrapark, Gaurighat, Sinamangal, Anamnagar, Baneswor, Ghattekulo, New Road, Bhotahiti, and Kamalachi) were selected and interviewed along with tens focus groups discussions organized with managers of water suppliers at Sinamagal, Chabahil, Gaurighat, Mitrapark, Dhubarahi, Kapan, Boudha, Sukedhara, Baneswor and Ghattekulo.

### Data Collection and analysis

The simple random sample method was used to selected household for interview in the study area. The study was carried out in the eighteen research areas (Sundarijal to Mahakalchor, Kapan, Chabahil, Dhumbarahi, Boudha, Shankhapark, Sukedhara, Gaurighat, Mitrapark, Sinamangal, Anamnagar, Gaushala, Baneswor, Ghattekulo, New Road, Bhotahiti, and Kamalachi supply points) in Kathmandu district. Altogether 169 (91 female & 62 male) people in 153 household and 25 water suppliers including the Kathmandu Upatyaka Khanepani Limited (KUKL), community water suppliers and private water suppliers were much demanded to supply water in the study areas were interviewed and 10 focus groups discussion with water manager were conducted. The transit walks, observations of treatment techniques and cleaning practice of their factories, interactions, interviewed were conducted frequently. The self-observations were done with the check list to verify and validate the findings. Collected data were entered and analysis in Microsoft-Excel 2011 and presented in chart diagram and figures.

**Table 1**

*Details of Respondents*

| **Social status of respondent Gender** | | |
|---|---|---|
| Gender | Number | Percentage (%) |
| Male | 62 | 40.52 |
| Female | 91 | 59.48 |
| **Family Type** | | |
| Type | No. of respondent | Percentage (%) |
| Nuclear Type | 103 | 67.32 |
| Joint | 50 | 32.68 |
| **Caste categories of Respondent** | | |
| Caste categories | No. of respondent | Percentage (%) |
| Brahmin & Chhetri | 62 | 40.52 |
| Janajati | 84 | 54.9 |
| Dalit | 1 | 0.653 |
| Madhesi | 6 | 3.92 |

| **Education level** | | |
|---|---|---|
| Education level | No. of respondent | Percentage (%) |
| Illiterate | 9 | 5.88 |
| Literate | 12 | 7.84 |
| Under SEE | 20 | 13.07 |
| Above SEE | 112 | 73.2 |
| **Age of Respondent** | | |
| Age | No. of respondent | Percentage (%) |
| 20-29 | 7 | 4.58 |
| 30-39 | 40 | 26.14 |
| 40-49 | 63 | 41.18 |
| 50-59 | 25 | 16.34 |
| 60-69 | 16 | 10.46 |
| 70-79 | 1 | 0.65 |
| 80-89 | 1 | 0.65 |
| | Total Respondents | Percentage (%) |
| | 153 | 100 |

**Ethical consideration**

The oral ethical consent was taken prior interview in household and group discussion. The individual authorities of water suppliers were approach to obtained their consent to carry out the study. The purpose of study was also explained to all participants and they were not compulsory to answer any questions which they did not like and they were free to terminate the interview at any time.

**Survey tools and techniques**

The mass media communication- radio/ TV shows, newspapers were reviewed, interacted with water users and peer groups, to get key issues of the problems facing by community people of Kathmandu. The problems interacted with KUKL staff, other technicians and experts, water vendors, and water users. With intensive field visits, then structural questionnaire was prepared to interview and checklists were prepared for focus group discussions with community and private vendors.

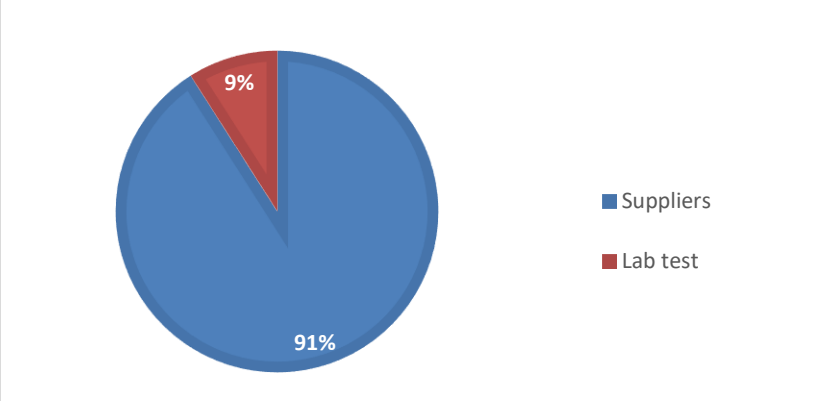
The study tools were questionnaire-based interview, personal observation, and a checklist. The pilot survey was conducted in the water suppliers including the KUKL. The questionnaire was designed includes question based on facilities of water supplies system, quality of water, water treatment practices, water borne disease and related problem.

## Results and Discussion

### Drinking water quality management in Kathmandu

The study revealed that majority of respondents (91%) depended on the suppliers for their drinking water quality, they believed on them because they did not know about lab test for water quality. Some water vendors showed the lab test report and license of the water supplier. However, the consumer did not ask to verify the lab test report validity to report's data and have an authorized license or not. This is the huge gap in knowledge among water users. Only 9% respondent has performed lab tests for their drinking water and managed the drinking water quality **(Fig.1).** People have least concern about water quality in kathmandu as there remains water scarcity most of the time and supply remain limited, that might be reason for peoples; concern on water quantity rather than quality. Other reason could be leakeage of pipeline though suppliers has tested the quality, and poor monitoring system to penalize on the supply of low-quality water. Regular monitoring of water quality is a civic right to prevent diseases and hazards, as well as further pollution (Shrestha, 2010).

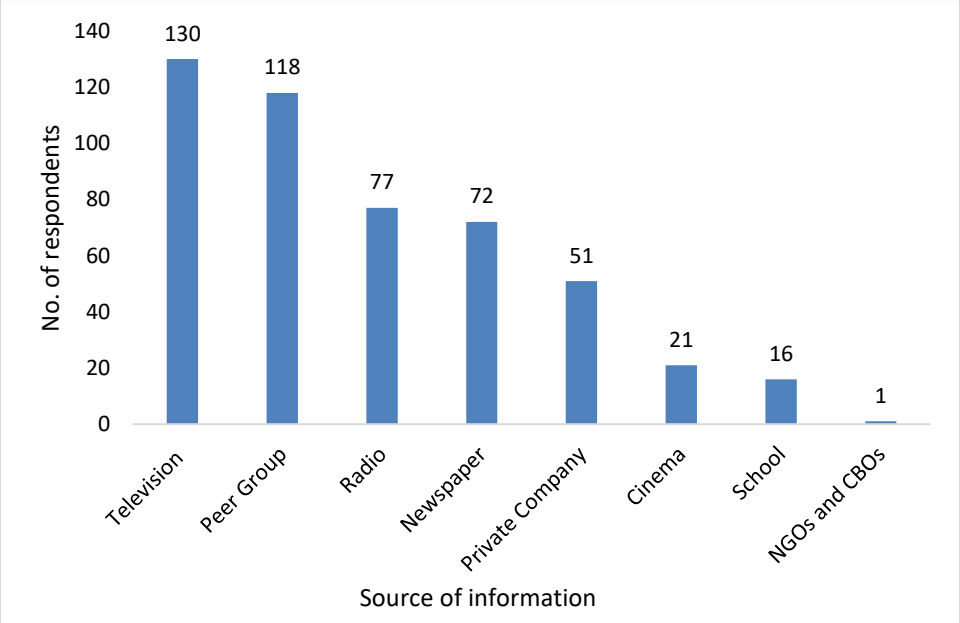
**Figure 1**
*Drinking Water Quality Management*




### Sources of information on water purification

Most of the respondents received information on water purification, treatment technique, and their management from different sources such as radio, the products of purifiers from television, radio, cinema, newspaper, personal sales persons, school education, INGOs, and peer groups. About 84% of respondents received information from television, 50% from radio, 14% from cinema, 33% from sales representatives, 11% from school teachers, 77% from peer groups, and less than 1% from I/NGO working in water purification (Fig 2). The respondents also said that most of the advertised message was found marketing for private companies' water purifiers and treatment plants.

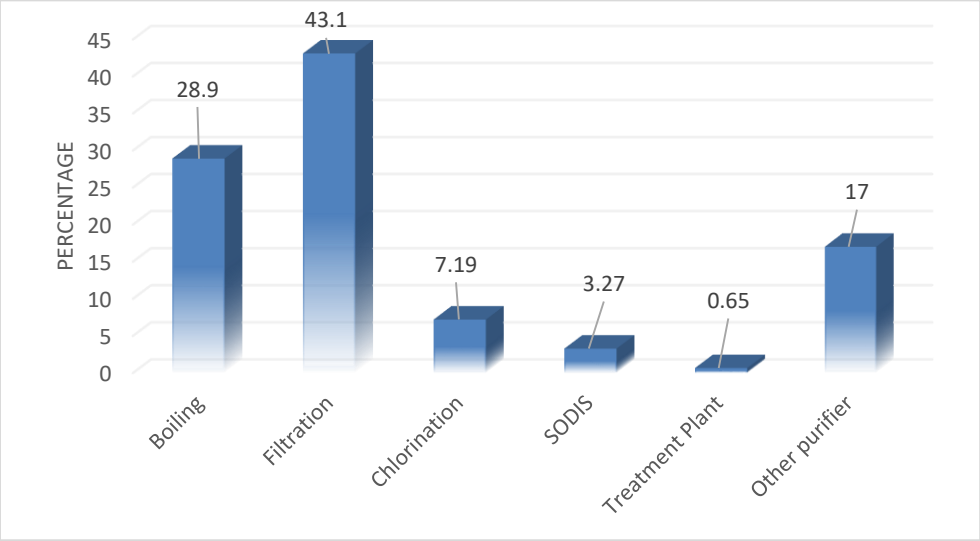
**Figure 2**
*Sources of Information on Water Purification*




**Drinking Water Treatment Practices in Kathmandu**

Majority of the respondents used the traditional practice of purifying the water including ceramic filter candles (43.1%), boiling (28%), chlorination method (7.19), bleaching powder, solar disinfectant with ultraviolet rays of sunlight (3.27%), and treatment vessels/plant (0.65) to purify the ground-water extract and home purifier of different brand (17%) (like Kent, Aqua guard, Sunrise, Crystal wave, etc.) with reversed osmosis and UV light **(**Fig 3). Similar study has been done in women in Pakistan in which 39% has knowledge about boiling and 8.7% respondents used chlorination method and 35% women used cloth filter metho which differ from this finding (Figueroa & Hulme, 2008). The total coliform, turbidity, electrical conductivity, pH, ammonia, and arsenic has contaminated the sources of drinking water like taps, tub wells and spouts that deviant the guideline of WHO and Nepal standard for drinking water (Tamrakar et. al, 2017).

**Figure 3**
*Water Purification Methods*

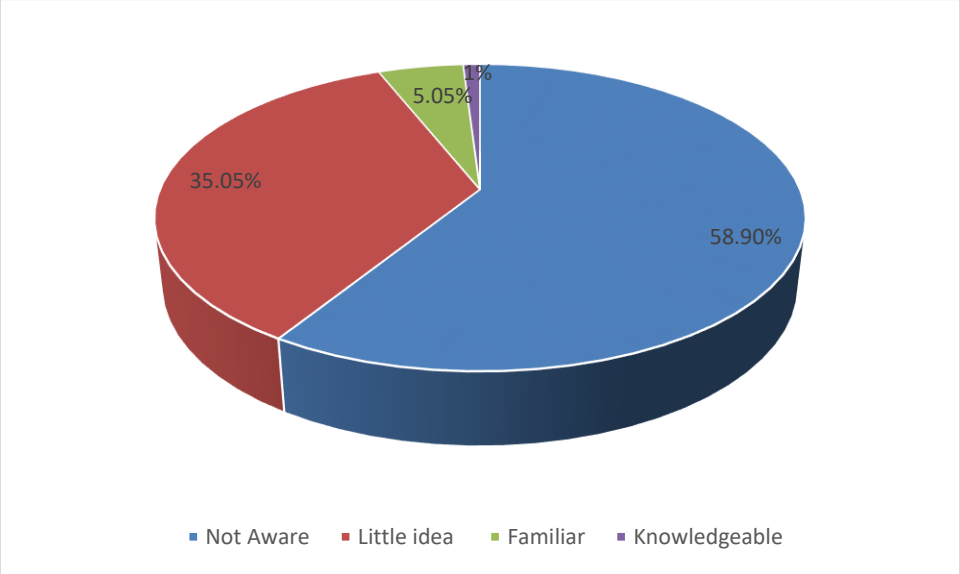



**Community perception on water-borne disease**

The study reported four categorical responses, among which only one percent of respondents were aware about water-borne diseases. Similarly, 5.05% of respondents were familiar with water-borne diseases and problems but were not following prevention methods. However, large percent (35.05%) of respondents had only heard about water-borne diseases and problems but they lack further knowledge on it. Interestingly, majority of respondents (58.90%) were completely unaware about water-borne diseases and related problems **(Fig:4)**. It might be due to they seek only sufficient water for their household need and they did not check their quality due to unawareness regarding the safe water quality and water borne disease. It also might be lack of proper information as well the respondents do not know health-based physical, chemical, and microbiological parameters (Prasai et.al., 2007) hence they never made complaints about water-borne diseases and related problem. However, safe drinking water quality is a common right and directly related to public health but there have been enteric bacteria and faecal particles reported from drinking water via pipeline and jar water of Kathmandu valley (Prasai et.al.2007; Shakya et.al., 2012; Maharjan, 2018). However, people complained for pipe supplied water including tube wells because it has turbid and sometimes bad smell. And the consumption of contaminated water has major cause of water borne disease (Prasai et.al.2007; Figueroa & Hulme, 2008) and the drinking water quality of deep tube wells, dug wells, and stone spouts are found vulnerable to consumption without proper treatment (Kharel, 2019). The drinking water quality of Kathmandu Valley has been already recommended for use only after intense purification due to presence of coliform bacteria (Bhattarai, 2010).

**Figure 4**

*Awareness Level of Water-Borne Disease in Community*




In Kathmandu Valley, though the water supply is limited, still the quality has not been assured even for domestic use other than drinking. To address the problem, groundwater has been recommended as potential source of drinking water and about 45% people already using tgroundwater forhe drinking and other domestic pruposes (Pant, 2011). The drinking water quality of deep tube wells, dug wells, and stone spouts are found vulnerable to consumption without proper treatment (Kharel, 2019). The heavy metal concentrations in the central groundwater district were higher in comparison to the northern and southern groundwater districts in Kathmandu (Shrestha et.al.,2014). A higher level of arsenic was found in the deep groundwater of Kathmandu due to the natural source under the reductive process (Shrestha et.al., 2013). Drinking water quality has been challenging in Kathmandu Valley. The quantity has always been prioritized over the quality of drinking water.

## Conclusion

The study has shown insufficient knowledge, and poor practices for water quality management and prevention to water-borne diseases in Kathmandu. Though the city is modernized, well planned, well tested, and safe drinking water supply are still in doubt with very poor perception and negligible concern among people. Thus, present finding suggests for the immediate need of water quality assessment in Kathmandu, along with regular awareness program on safe drinking water and prevention from water born diseases via multiple media in effective form.

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**Conflict of Interest:** No conflict of interest.

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