



Assessment of Ablution Water Consumption in Mosques

Aliya Ali Said Al Alawi

University of Technology and Applied Sciences, Muscat, Sultanate of Oman
aliya.alalawi@utas.edu.om

Parameswari K.

University of Technology and Applied Sciences, Muscat, Sultanate of Oman
parameswari.k@utas.edu.om

Gopalakrishnan Kumarasamy

University of Technology and Applied Sciences, Muscat, Sultanate of Oman
gopalakrishnan.kumarasamy@utas.edu.om

Khoula Said Al Kaabi

University of Technology and Applied Sciences, Muscat, Sultanate of Oman
khoula.alkaabi@utas.edu.om

Abstract

In Muslim majority countries, like those of the Gulf Cooperation Council (GCC), ablution is a necessary component to fulfil religious commitments of prayer, thus a significant amount of water is consumed on daily basis with minimal efforts and measures to manage or conserve that water use. This study aims to highlight the importance of redesigning the appliances in the Mosque for ablution purposes to save scarce water. The study assesses the water usage during ritual ablution (wudu-following Prophet Muhammad's (PBUH) way) in the Mosques of Oman. The findings from this study can have a global impact, as it can set an example for GCC countries as well as other countries all over the world where ablution is being practiced. Total consumption per capita for performing ritual ablution was measured using the normal tap, sensor tap, and pot. The study found that 7 L is being used while using normal and sensor taps of water per ablution while it could be done with 0.6 L of water. The major conclusion of the study is that current water consumption for ablution in Oman is around 8 times more than that of following Prophet Muhammad's (PBUH) way-during ablution. Special taps that conserve water and suit the purpose of ablution have to be designed.

Keywords: Ablution; Water; Mosques; Management; Conservation

1 Introduction

Water is a precious natural resource that has to be managed efficiently in all the sectors such as domestic, industrial, agricultural, and commercial consumption and usage in public buildings such as mosques, government offices etc. Because of urbanization and modernization advanced appliances have been introduced in the water usage sector without serving water management for different purposes. In the present study, water usage in mosques has been considered. In mosques, the major amount of water is used for ablution which is a ritual performance before the prayer. The ritual ablution is known as 'Wudu', which means cleaning the different exposed parts of the body before performing the prayer in the mosques. The 'Wudu' process is washing hands up to wrists, rinsing the mouth and nose, the entire face and arms to the elbows, then wiping the head and ears and washing the feet to the ankles and, as shown in Figure 2.4 (Abu-Rizaiza, 2002). Presently either manual tap or sensor tap is being used for ablution.



Fig. 1: Steps in the ablution process for prayer (Abu-Rizaiza, 2002)

Previous literature studies claimed that about 90% of the water consumed in mosques is used for performing the ritual ablution (Suratkon et al., 2014; Rahman et. al, 2016; Prathapar et al., 2005). Once the water is used for ablution, it is allowed to run and drain away as waste water without any other usage. As quoted in the Hadith (Ibn Majah – Book 2, Hadith 425), Prophet Muhammad reminded Muslims to avoid wastage of water, even when performing the cleansing ritual of ablution before prayer. A recent study in a university mosque in Malaysia (Utaberta, 2014) and another study in a university mosque in Oman by Prathapar et al. (2005) and Aliya et al. (2021) assessed the amount of grey water produced from ablution. The study reveals recycling and reuse of this significant quantity of greywater and water demand management especially in mosques is very limited; hence, an investigation into this aspect is the need of the hour to save the precious resource. The present study aims to enable the management of required water demand in public buildings, especially the mosques in the Sultanate of Oman. The existing appliances such as manual and sensor taps are used for ablution consuming the maximum quantity of water. The major amount of consumed water is not efficiently used for ablution. While performing the ‘Wudu’ if it is a manual tap, people open the tap and it will not be closed until performing the full ablution. Similarly, in a sensor tap which have an automatic on-and-off process, it takes a few seconds to arrest the water flow which is not considered to be an efficient way from a water management perspective mainly for ablution purpose. The research study enhances the saving potential of water by considering the religious policies which can promote the invention of suitable appliances and techniques which suits the mosques.

2 Methodology of the Study

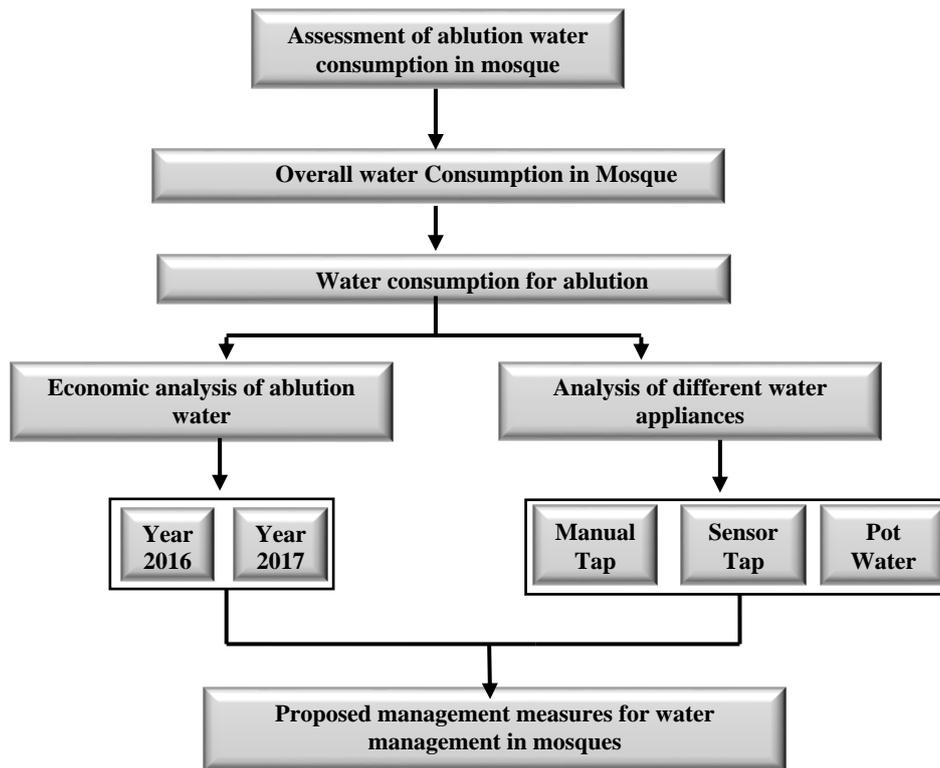


Fig. 2: Framework of the study

In this study, qualitative and quantitative analysis have been made by collecting data from various government sectors. The overall water consumption data has been collected from PAEW (Public Authority for Electricity and Water) Oman's annual report. Information regarding the various water dispensing systems such as types of taps, toilet systems employed in the mosques have been collected from the Ministry of Regional Municipalities and Water Resources and by interviews and observations. From this data, the types of taps used in the different mosques were identified and the consumption rate for the different taps was calculated. The research included both types of mosques, the Jama (big mosque) and Masjid (small mosque). Additionally, qualitative data has been collected through the questionnaire survey. The main reason for the qualitative survey was to assess the behaviors of the users and the social acceptance of reusing the ablution water. The qualitative survey data has been collected from engineers of PAEW, Mosque management, the public who performs the prayer in the mosques, and the policymakers. For the quantitative study, a total of 120 users were identified from different mosques and the per capita water consumption was recorded. A special device for measuring the discharge is found and it was fitted into the mosque taps. Different taps were identified in the different mosques and the discharge measuring device has been attached and the per capita rate has been collected while performing the ritual ablution. The researcher informs the users about the presence of a discharge measuring device and asks them to perform as usual ritual ablution. At the same time, the majority of the persons who perform the prayer in the mosque are not willing to use the pot-type method of ablution. For identifying the quantity of water required for ablution by pot method, the researcher collected the data at the local level from home. Finally, the data collected from various places and methods are analysed and identified for further processing.

3 Water Consumption for Ablution

3.1 Overall Water Consumption in the Mosque

In this research, the water consumption in Oman mosques was analyzed and compared for the years 2016 and 2017. The total number of mosques considered for the study is 688. For the year 2016, 11 months of water consumption data are only available. But for the year 2017, 12 months of water consumption data were available. During the year 2016, the total water consumption in the mosques was quantified as 158,339,867 gallons which is equal to 712,529,401 litres. Similarly, the water consumption for the year 2017 was quantified as 217,901,095 gallons which are equal to 980,554,927 litres. The drastic increase in water consumption is mainly due to an increase in population and 12 months of data were considered here. To maintain uniformity between the years, 11 months of data were considered.

3.2 Ablution Water Consumption

Most of the literature quoted that around 90% of the water used in mosques are for ritual ablution purpose (Suratkon et al., 2014; Rahman et. al, 2016; Prathapar et al., 2005). The per capita average total water consumption includes toilet flushing and usage of taps in the toilet, along with ablution consumption is shown in Table 1. The present study shows that only 25% to 35% of the overall consumption is being used for ablution as shown in the table. The water consumption data for ablution is measured from Jama and Masjid using sensor and manual taps respectively. As per the present study, 50% of the current ablution water consumption serves the need for ritual ablution.

Table 1: Ablution water consumption

	Average total Consumption in litres	Ablution Consumption in litres	Percentage variation
Jama	24.7	7.5	30
Masjid	9.7	2.5	26

4 Economic Analysis of Ablution Water

4.1 Economic Analysis of Water Bills for the year 2016

The overall consumption of water and its cost for 688 mosques for the duration of 11 months (January to November) for the year 2016. Overall water consumption in the mosque during this period was 158,339,867 gallons (712,529,401 litres). In 2016 for the initial two months (January and February) the rate of water per gallon in Oman was 0.0025 baisa. Later the month of March the rate changed to 0.0035 baisas. The water consumption bill was calculated using 0.0025 baisas for the initial period, for the rest of the period the rate has been considered as 0.0035 baisa. The overall cost consumed for 688 mosques over a period of 11 months is around 511,787 OMR.

4.2 Economic Analysis of Water Bills for the year 2017

The water consumption data from January to December for 688 mosques were collected. Overall water consumption during 2017 was 217,901,095 gallons (980,554,927 litres). The tariff per gallon of water was 0.0035 baisa in Oman. The total cost for the year 2017 was estimated at 763,974 OMR. The aforementioned data includes 12 months in 2017, whereas, for the year 2016, only 11 months of data were available.

Presently for the year 2017, the water consumption and its respective rates were analyzed and

compared for 11 months period (January to November). Overall consumption of water for the year 2017 was 198,807,075 gallons (894,631,837 litres). The overall cost consumed for 688 mosques over 11 months is around 697,145 OMR.

In comparison between 2016 and 2017 data shows a drastic increase in the quantity of water and thereby consumption cost increases. It may be due to an increase in population and also variation in the rate used for per capita consumption. Lifestyle is an important parameter that contributes to the increase in water consumption.

5 Analysis of Different Techniques in Existing Water Supply Appliances

General observation on current water flow for ablution can be reduced to 50% of the existing water consumption. This can be effectively achieved by selecting appropriate water appliances for ablution purposes. Previous literature on water demand management (Jamrah et al., 2008; Kayaga & Smout, 2007; Jamrah et al., 2006; Prathapar et al., 2005) shows that around 50% of water could be saved by changing the appliances. The average overall consumption per capita using the modern tap (sensor tap) with timer is 18L and 4.5L for ablution per capita. While the overall consumption per capita using the manual tap is 9L and 3.1L for ablution per capita. The analysis clearly shows that the modernization of the existing manual tap doesn't serve the purpose of water saving in regards to ablution. The results show the necessity of redesigning special taps for ablution.

As per the water consumption in the year 2016, the water bill with government support is 511787 OMR. Adopting the changes in the water appliances can save 50% of the water bill which is around 255,894 OMR. The water bill without government support is around 1,108,379 OMR in the year 2016. While adopting the proposed changes, about 50% of this water bill comes to 554,189 OMR can be saved. As per the water consumption in the year 2017, the water bill with government support is 697,145 OMR. Adopting the changes in the water appliances can save up to 50% of the water bill which is around 348,572 OMR. The water bill without government support is around 1,391,649 OMR in the year 2017. While adopting the changes about 50% of this water bill comes to 695,824 OMR can be saved.

6 Percentage Saving by Changing the Ablution Device Method to Using A Pot

The actual quantity of water traditionally required for ablution is measured by using a suitable pot with a measured quantity of water. The quantity of water required traditionally has been compared with the quantity consumed by normal and sensor taps. The average overall pot consumption per capita is around 0.6 L for ablution. It saves almost 80% of total water consumption used for ablution using sensors and manual taps. If the population is around 2.04 billion and considering ablution and praying 5 times a day with a consumption rate of 0.6 L will come to around 6.12 billion L of water consumption. By introducing the specifically designed taps for ablution with minimal water consumption, both the natural and financial resources can be saved by 80%.

7 Conclusion

In this present study, different water supply appliances such as sensor taps, manual taps and pots were considered for measuring the water consumption for ablution in the mosques. The study reveals that different appliances have varied discharge rates and the consumption cost were varying as per the discharge rate. The different appliances used in the mosque satisfy the purpose of ablution but are not efficient from the water management perspective. Most of the mosques were equipped with sensors and manual taps in Oman. While considering the sensor and manual tap, about 4.5 L and 3.1 L of

water per capita are required for performing the ritual ablution respectively. At the same time, the ritual ablution is performed by using a pot means about 0.6 L of water would be sufficient. This phenomenon indicates that about 80% of water can be saved when compared to its current usage. In Oman, the annual consumption of water in mosques is around 894,631,837 L at 697,145 OMR. Every year, the consumption of water has increased with respect to the population growth and standard of living. As per the research, a new device has to be designed with the same discharge rate as the pot which reduces 80% of the present water consumption. The newly designed appliances will also save natural resources and be helpful for saving the economy of the country. Apart from economic benefits and water-saving concepts, the ablution water can be recycled and reused since it has less amount of contamination. The recycled water cannot be used again for ablution though it meets the potable standards due to religious constraints. However, it can be reused for flushing toilets, cleaning purposes, and irrigating the landscape around the mosques which may benefit a considerable amount in the water bills.

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Cite as: Al Alawi A.A.S., Parameswari K., Kumarasamy G. & Al Kaabi K.S., "Assessment of Ablution Water Consumption in Mosques", *The 2nd International Conference on Civil Infrastructure and Construction (CIC 2023)*, Doha, Qatar, 5-8 February 2023, DOI: <https://doi.org/10.29117/cic.2023.0155>