

## Tap Use and Hand Washing Activities of Kitchen Staff in Restaurants within Gauteng, South Africa

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### Abstract

This paper seeks to identify the common behaviours of kitchen staff when using the tap and practices of washing hands. The study involved the reporting of a mixed method research design. All water usage practices and hand washing behaviour observed during the fieldwork process were noted. During general kitchen activities, staff only closed the taps properly nine times and left the taps open four times for the duration of the activity only. Taps left open during cleaning procedures occurred 24 times. Furthermore, taps were not properly closed 12 times. Staff took soap from the dispenser first, 29 times before opening the tap. The water used for rinsing hands was caught in a basin nine times and wiping hands with a wet cloth instead of washing with water and soap occurred twice. There is some form of awareness regarding hand hygiene and the practice of saving water, but not as evident during various other kitchen activities. Work-specific focus needs to take place to achieve water saving in the restaurant sector. A repetition of this study may lead to interesting finds on how the pandemic changed the hand washing awareness of kitchen staff whilst water shortages are occurring.

**Keywords:** Tap use, hand washing, water, South Africa

### Introduction

The world has embraced the global pandemic of the Corona Virus Disease 2019 (Covid-19) with the shift in how humans interact and what is characterised as the new norm. Recommended measures to prevent further spread of the disease have included the wearing of masks, covering of coughs and sneezes, social distancing, keeping unwashed hands away from the face, and most importantly, frequent hand washing with soap and water (Rangarajan, Sivakumar & Choopalan, 2020; World Health Organization (WHO) & United Nations Children's Fund (UNICEF), 2020). Hand hygiene is one of the most important measures in preventing the further spread of any disease, with the use of soap and water as an effective solution, coupled with the use of sanitisers. Proper hand hygiene practices are critical to ensure the prevention of food-borne illnesses (Green, Selman, Radke, Ripley, Mack, Reimann, Stigger, Motsinger & Bushnell, 2006). It is evident that water is an essential component of hygiene during the Covid-19 pandemic. Similarly, water and hygiene are critical factors to

maintain safety within the food industry, specifically, for the prevention of food-borne illnesses and sickness. Good hygiene practices, which require water in most cases, are the backbone of any food industry, and maintaining hygiene practices throughout the kitchen can contribute to a pleasant working environment, productivity, correct mental behaviour, conducive education, and food safety (Gordon-Davis, 2012). The United Nations (UN) (2019) reported in 2019 that extensive efforts need to be employed to meet the required sustainable development goal no. 6 of ensuring availability of safe drinking water, sanitation, and access to hand washing facilities for all. During 2020, the WHO and UNICEF (2020) further reiterated the importance of providing safe water, better sanitation, and improved hygiene conditions to all as a measure to prevent any further disease outbreaks. It therefore becomes critical to emphasise the need to find alternative solutions to save water and reduce any loss of water.

Water scarcity is a worldwide problem, and the global demand and supply gap may exceed 40% of current usage by the year 2030 (Tuppen, 2013). Worldwide, billions of people still do not have access to basic sanitation and safe water (UN, 2019), which is also true for South Africa (SA) (Chernick, 2016). In SA, water scarcity is a reality and measures need to be taken to reduce any unwanted or unnecessary wastage thereof. As SA experienced one of the most significant droughts in 23 years during 2016, water saving practices have become an issue of great importance. If the issues of water supply and demand are not addressed, the water supply will reach critical levels by 2035 (Chernick, 2016). Moreover, water is an essential source of life and without it, people may be forced to look for alternative sources. For example, Singh (2016) mentions how, in some provinces of SA, drought can lead to people having to resort to drinking sewerage water.

This paper seeks to answer the following research questions: What is the behaviour of kitchen staff during hand washing and tap use when doing general kitchen activities? How does the behaviour compare to advertised recommendations? The aim of this paper is, therefore, to report on the behaviours of kitchen staff within restaurants with a specific focus on tap use and hand washing practices in SA. There is currently limited literature available analysing and reporting on water usage during general kitchen activities; however, research is available on the practices of hand hygiene and knowledge of food handlers of food safety. Therefore, the objectives, which form the basis of the paper, are:

- To understand the general guidelines available on the Internet regarding hand washing practices.
- To identify what are the general water usage practices of restaurant kitchen staff when performing general kitchen activities and hand washing.
- To compare advertised recommendations with actual behaviours of kitchen staff.

## Literature review

Restaurants use vast amounts of water for cleaning, production, and preparation of food. In the restaurant environment, fresh water is obtained through taps. If incorrectly used, taps can contribute to water wastage of up to 151 litres per day and accumulate to more than 30 000 litres over a period of six months. Water used by restaurants is regarded as greywater, due to the food scraps and grease polluting the water (Barnstable County Department of Health and Environment, 2016; Tauranga City, 2011). Furthermore, if the facility and staff have been exposed to Covid-19, it remains critical to clean all equipment, floors, and surfaces and discard the water and soap in a fenced-off soak-away pit (WHO & UNICEF, 2020), which does not allow for any form of recycling to take place.

Many factors can contribute to how individuals wash their hands and use water, with barriers to effective hand hygiene being the availability of soap and hot water, neglected hand washing facilities, such as basins, availability of towels and drying paper, and possibly poor

facility designs (Pragle Harding & Mack, 2001). The amount of work done during the day by kitchen staff and the time available for washing hands can also be an inhibitor of hand hygiene (Do Prado, Bettoni, Correa, De Abreu Filo, Garcia, Tognim & Cardoso, 2015). Hand washing practices are further influenced by the amount of awareness and instructions given and with the absence of sufficient personal protective equipment, hand washing compliance and practices may also be affected (Campos, Candonha, Pinheiro, Ferreira, De Azevedo & Stamford, 2009). According to Principato, Secondi and Pratesi, (2014) an individual's behaviour is further influenced by the level of awareness in their surroundings. The aforementioned implies that if more information is displayed, the behaviour is most like to change. A person's consciousness, demographic and socio-economic status also have an impact on changing behaviour (William, Wikström, Otterbring, Löfgren & Gustafsson, 2012). To add, a person's behaviour outside the working environment can also influence the actions at the workplace (Green, Radke, Maso, Bushnell, Reimann, Mack, Motsinder, Stigger & Selman, 2007). Other factors also include individual's practices, attitude, knowledge, rules, and policies of the restaurant and the type of communication methods present, such as posters and training. Studies by Barr (2007) report how sound knowledge about water saving and hand washing practices could contribute to positive behaviour as changes which were noted after training was given to staff. In a study done by Pragle et al. (2001) staff within the restaurant environment indicated, that the display of posters and signs positively reinforced the importance of hand washing. Furthermore, Aydin, Deniz and Kiraz (2017) found how important it is to provide training to transform attitude and behaviour.

Conserving water is important to ensure that the supply is not hindered and prematurely depleted. Water is needed for many facets in life and without water life will cease to exist for all living organisms. Similarly, water is needed in most cases for maintaining hygiene and the prevention of sickness and disease. If the use of water is not managed properly, it will result in shortages. It remains important to assess and understand the way in which water is used within society and business, and through research, ways to control the use of water may contribute to a longer supply.

## **Methodology**

Step one included a general review of advertised guidelines on hand washing and tap use in restaurants. Step two involved the reporting of a mixed method research design, whereby observations were done using field notes and frequencies of activities (number of times completed during the observations) were recorded. All water usage and hand washing behaviours observed during the fieldwork process were noted. Ethical clearance was gained before fieldwork commenced (Ethics Clearance Number: ECN34-2017). During observations, participating staff members were not made aware of what was being observed, to resemble a natural and unchanged setting. The researcher did not participate in any kitchen or restaurant activities; therefore, taking on the role of an observer. The field notes were based on an unstructured observation method. Observation times were pre-determined by the management staff of the selected restaurants and took place during the busiest times of a specific shift. Fifty three restaurants in the Vaal region of Gauteng, SA met the inclusion criteria set out for this study. However, data saturation occurred after 19 observations and the results were reported accordingly. The duration of the observations was between 60 minutes and 120 minutes. The information gathered was coded using ATLAS.ti and analysed to allow for the creation of themes and categories. The themes were then further divided into categories, whereby concepts and each action were recorded with the number of frequencies observed allocated. Frequencies were reported as the number of times the actions were performed by the staff members in each



of the participating restaurants. The final step, step three, included a comparison between the actual behaviours of kitchen staff and advertised recommendations.

## Findings

### *A review of general guidelines within the hospitality industry*

An internet search was conducted to review the literature on hand washing and tap use within the hospitality industry, with a specific focus on restaurants. The keywords ‘tap use; and ‘hand washing’ was typed into a search engine and two websites were randomly selected, namely The Restaurant Association of South Africa (RASA) (2019), which is a non-profit organisation that was formed in 2004 and represents the South African restaurateur and an article published by Buxton (2017) on a popular food brand website. As benchmarks for objective 1, the information found on the RASA website and the article published by Buxton (2017) were used. Table 1 presents the list of general recommendations provided on the RASA (2019) and Buxton (2017) in a summarised form. RASA (2019) reports on the procedures of hand washing with recommendations of using antibacterial soap, preferably hot water, and washing of hand should not exceed 20 seconds. It is, however, highlighted that hand washing and hand washing facilities are very important components in kitchen hygiene. Buxton (2017) covers both aspects of tap use and hand washing but also includes useful recycling tips for water. Recommendations include putting plugs in basins and closing taps properly. Dishes are to be scraped clean first before rinsing, do not rinse items individually and rather use a basin filled with water, re-use water from ice buckets and unsalted water left after cooking may be used for cleaning of floors. Another recommendation included the implementation of motion-sensor taps. This will allow for the control of water usage, as it automatically turns off after use. Furthermore, when referring to the practice of hand washing recommendations, the recommendations include educating staff and displaying posters and pamphlets, asking for assistance during the process of washing hands, catching the sink water to use in the garden, and the use of paper towels instead of cloth towels, which would later require water for washing.

Table 1. Summarised recommendations from RASA (2019) and Buxton (2017)

ORGANISATION NAME	DESCRIPTION ON INFORMATION PROVIDED
1. Buxton (2017)	1.1 Educate staff and display information. 1.2 Do not throw away unsalted water after it has been used in cooking. 1.3 Re-use water from ice buckets. 1.4 Ask others to assist during hand washing. 1.5 Keep the plug in the basins whilst hand washing to catch the water and rinse hands in the same water. 1.6 Use paper towels instead of material cloths as it minimises laundry and water use. 1.7 Plan ahead and defrost items in the refrigerator and not in water. 1.8 Rinsed dishes in a basin or tub and re-use the water. 1.9 Do not rinse items individually, rather in a basin with water. 1.10 Ensure dishwasher is full before starting. 1.11 Install motion sensors on taps. 1.12 Put plugs in basins to catch water. 1.13 Close taps properly.
2. Restaurant Association of South Africa (RASA) (2019)	2.1 Hand washing with hot soapy water. 2.2 Use antibacterial soap. 2.3 Hand washing should not take longer than 20 seconds. 2.4 Proper hand washing facility and techniques are essential (Items must include anti-bacteriological hand soap, hand sanitisers, paper towels, and dustbins).

Further literature was found when the keywords ‘tap use’ and ‘hand washing’ were typed into

the search engine on other websites and organisations (BusinessTech, 2019; Center for Disease Control and Prevention, 2019; Waterwise, 2019; World Wildlife Fund South Africa 2019) who also present various recommendations relating to being water wise and conserving water, but recommendations are more generalised and not specifically focussed on restaurants. Similarities did, however, occur and included recommendations such as fixing all water leaks, closing taps properly, catching runoff water and recycling, only washing full loads in a dishwasher and installing energy-efficient dishwashers. The Centre for Disease Control and Prevention (2019) included more detailed recommendations for hand washing, namely wetting of hands with clean, running water, either warm or cold and then turning off the tap; after applying the soap, lather your hands by rubbing them together with the soap; hands should be scrubbed for at least 20 seconds; rinse your hands well under clean, running water; dry your hands using a clean towel or air dry them. Another standard recommendation included educating staff and customers on hand washing (BusinessTech, 2019). Reference is made to a minimum time of 20 seconds, whilst the second recommendation indicates not exceeding that time frame. This raises the question of whether 20 seconds is an appropriate time to wash hands? Will exceeding the time of 20 seconds constitute as wasting water? When considering the Covid-19 pandemic, the recommendation is to consider washing hands for 20 seconds to ensure effective cleanliness (Rangarajan et al., 2020; Sarla, 2020).

When comparing the recommendations within the South African borders to recommendations internationally, a few similarities occur. The literature revealed that there is a general encouragement to lowering water wastage and common hand hygiene suggestions include educating staff and placing posters in kitchen areas where taps are found (Natura, 2018), asking staff members to assist one another during hand washing by closing taps whilst lathering soap into hands (Arrington, 2015; Buxton, 2017), not rinsing individual items under running taps and rather filling up containers to use the water for rinsing (Arrington, 2015), installing motion sensor or low flow taps to reduce the amount of water wastage (Arrington, 2015; Buxton, 2017), regular maintenance should be done on leaking pipes (Arrington, 2015; Webstarantstore, 2018) and closing of taps whilst doing other activities in the kitchen (Arrington, 2015; Reliable Water Services, 2018). Another common recommendation included the washing of hands with running water and soap before starting a shift within the restaurant and food industry (Gordon-Davis, 2012; Richardson, Foskett, Paskins & Thorpe, 2017). The amount of information pertaining to hand washing across different websites shares similarities and provides a basic guideline for hygiene practices for restaurant staff. The recommendations also encourage a more sparing approach to the use of water and can be assumed to be a useful and positive approach to creating awareness of water saving behaviour.

### ***The general practices of kitchen staff***

The research study involved the observation of all kitchen activities, but for the purpose of this review, only tap use as an activity and hand washing behaviours will be included. The research study reported on the habits and practices of kitchen staff but for the purpose of this review, the actions of habits and practices were combined and referred to as behaviour. Table 2 depicts the observations and frequencies of hand washing behaviour. The behaviour of staff was divided into two categories, namely water saving and water wastage. For this review, water saving was defined as the process of using less water and recycling water where possible. Water wastage on the other hand was regarded as activities that resulted in unattended use of water, water spillages, and possible misuse of water, for example, leaving the tap open whilst unattended. Hand washing behaviours of kitchen staff seemed to lean towards water saving (45 times) compared to water wasting (14 times). It was noted that during hand washing activities, staff attempted to preserve or reuse the water by washing their hands in a basin with



food items inside (this behaviour may be regarded as possibly unhygienic, but it is not the focus of this article) and soapy water, eight times. Staff also conserved water during hand washing 30 times, by taking soap from the dispenser before opening the tap, rubbing hands thoroughly with soap before turning on the tap, pressing the knee mechanism only when the water was required and ensuring the tap was properly closed before walking away. The wearing of gloves, as recommended by Green et al. (2006) during different kitchen activities was evident, however, only twice and the use of wet cloths to clean hands during all kitchen activities also occurred twice. Staff also attempted to reduce the amount of water used by using cloths from the sanitation station to wipe hands. These types of behaviours can contribute to less water usage.

Table 2. Hand washing behaviours of kitchen staff

<b>Water saving behaviours</b>
<b>DURING RINSING</b> [Frequency 9] Hands rinsed under running tap. Water caught in basin with prawns and bacon. (8) Hands rinsed under a running spray nozzle. Nozzle closed while moving from one hand to the other. (8) Staff member rinses hands under running tap of dishwashing basin. Water caught in basin. Hands rinsed in basin with soapy water. (1)
<b>DURING HAND WASHING</b> [Frequency 30] Soap first taken from dispenser before starting hand washing process and then tap was opened. (26) Staff member checks tap to be properly closed before walking away after washing hands. (26) Manager takes soap from dispenser, presses knee mechanism only once, when needed, in order to wash hands. (4)
<b>WATERLESS HYGIENE</b> [Frequency 2] Staff wear gloves while cooking or working with any food products.
<b>WIPING OF HANDS ON WET CLOTH</b> [Frequency 2] Hands wiped with wet cloth when changing duties. Hands wiped with cloth from sanitation station.
<b>Water wastage behaviours</b>
<b>DURING AND AFTER HAND WASHING</b> [Frequency 20] Faucet not properly closed after washing hands. (14) Hands washed under running tap. Soap taken from dispenser after tap is opened. (14) Knee mechanism pressed in during hand washing process instead of pressing it once resulting in tap kept on running during process. (14) Hands rinsed under a running tap, and then sanitiser is applied. (5) Tap left running while five members wash hands after one another. (1)

Contrary, hand washing activities, which contributed to water wastage, also occurred; however, less frequently and included taps not properly closed after washing of hands, taking soap from the dispenser whilst the tap was open, keeping the knee mechanism suppressed whilst washing hands and leaving the tap open whilst scrubbing of hands (14 times). It was also observed that it was not common practice amongst all staff to catch the water used during hand washing into a bucket or drainage point for reuse. A possible area of reuse may be for watering of plants and gardens. It was noted (5) amongst kitchen staff that hands were rinsed under a running tap, no soap was used, and sanitiser was applied. According to Foddai, Grant and Dean (2016) although washing with water and soap is regarded as the golden standard to prevent contamination of food-borne diseases, the application of sanitiser alone is usually done when the hands are not visibly dirty or greasy but may only be applicable to certain industries and not specifically the restaurant industry. Sanitisers may not be able to remove dirt and grease. It is recommended that hand sanitisers are to be used as an optional follow up and that soap and water are best common practices, especially in a food service setting. In this study, the hands of the kitchen staff were not inspected and the lack of using soap could have been influenced by factors such as allergy, dislike or even no available soap in the dispenser. Ideally,

applying sanitiser after washing with soap and water is an effective means of combating the spread of disease.

Table 3 sets out the results on tap use during various kitchen activities and the observations were recorded under the theme of water wastage behaviour with categories: Tap left running; taps not properly closed; taps left running numerous times; and tap use after or during cleaning procedures. Within the theme of water saving practices, three categories were observed, namely taps closed during use/activity, tap properly closed and duration of tap use. Staff members leaving the tap running (45 times) and not closing the tap properly (24 times) during various general activities. The most frequent occurrence is leaving the tap running while cleaning down or wiping surfaces, cleaning out the basin where food items had defrosted, or taking water to a customer. Staff members were leaving the area without closing the tap properly and not ensuring that taps were properly closed, which may also contribute to high volumes of water loss. In contrast, there were some staff members doing things correctly, such as closing the taps properly (12 times) and ensuring the taps are used only when required (3 times). Staff members ensured the tap was properly closed before leaving and after the bucket was rinsed and filled up, twice. Staff members also considered water wastage during the spraying down of glasses. The spray nozzle was not kept open whilst moving from one glass to another. It was also noted that taps were opened only when required and not left open unnecessarily during various kitchen activities. However, when summarising the activities of the staff, water wastage occurred more frequently during general kitchen activities with higher frequencies with the opposite during hand washing activities where the water saving behaviour frequencies were higher. Staff members were wasting large amounts of water as the taps were not properly closed during the general kitchen activities (24 times) such as rinsing of cloths, rinsing of food items, and using water for cooking. Furthermore, the tap was left running whilst doing other kitchen activities (34 times) and during cleaning procedures, namely, staff emptied the buckets outside whilst the tap was left running for the refilling of the bucket, tap left open whilst wiping down surfaces, tap left open until warm water appeared and tap left on whilst searching for a container for soap. Staff left the tap open 34 times whilst wiping surfaces next to the basin, unclogging of drains, washing glasses in soapy water, leaving of tap open whilst unattended, tap left running whilst five staff members wash their hands after one another and tap left on until all the food items were removed from the basin. Further water wastage occurred when taps were left running during and after cleaning procedures (24 times) with activities of rinsing the cloths under a running tap, cleaning of basin whilst the tap is running, leaving the tap open whilst cleaning some utensils and over-filling the container whilst wiping surfaces. It becomes evident that water wastage is occurring more frequently during tap use for general kitchen activities than during hand washing activities.

Table 3. Tap use behaviours of kitchen staff

<b>Water wastage behaviour</b>
<b>TAP LEFT RUNNING [Frequency 45]</b> Tap left running unattended while surfaces are wiped and items packed away. (19) Tap left running while cleaning out basin where prawns were defrosted. (19) Tap left running before taking water from the tap for a customer. (19) Bucket water thrown outside in delivery area; bucket refilled after rinsing under running tap. (2) Dustbin rinsed under running tap and wiped with damp cloth. (2) Fruit rinsed under a running tap. Tap not properly closed (water flowing in small stream). (5) Tap left open while waiting for hot water. (19) Tap left running while searching for container with soap in. (19) Tap left open until all spinach has been removed.
<b>TAP NOT PROPERLY CLOSED [Frequency 24]</b> Same staff member leaves tap area; not properly closed (water running as small stream). Kitchen staff does not make sure faucets are properly closed before walking away. Sanitation water container faucet not properly closed. Lots of spillage on floor.



Tap not properly closed after rinsing cloth. Tap not properly closed when taking water for cooking. Lots of water spillage.
TAP LEFT RUNNING NUMEROUS TIMES [Frequency 34] Tap left running while wiping surfaces next to basin. Tap opened numerous times while washing basin and unclogging drainage hole. Staff member leaves tap open unattended. Glasses washed in soapy water, then sprayed individually with spray nozzle. Tap left open while cleaning some utensils. Cloth rinsed under running tap. Debris wiped from surface. Cloth re-rinsed.
TAP USE AFTER OR DURING CLEANING PROCEDURES [Frequency 24] Cloth rinsed under running tap, after wiping surfaces from debris. Tap left running to clean out basin. Tap left open while cleaning some utensils. Tap left open until all spinach has been removed. Tap left open to run over container while staff member wipe surfaces.
<b>Water saving behaviour</b>
TAPS PROPERLY CLOSED [Frequency 12] Tap finally closed after seeing observer checking the tap. Tap opened again to rinse cloth but closed properly this time. Kitchen staff member makes sure faucet is properly closed before walking away from basin. Staff member ensures tap is properly closed. Bucket rinsed and washed under a running tap. Tap closed during process. Tap opened again to rinse and fill bucket with water.
TAPS CLOSED DURING USE/ACTIVITY [Frequency 2] Glasses sprayed individually with spray nozzle. Nozzle not kept open while moving from one glass to another. Bucket rinsed and washed. Tap closed during process. Tap opened again to rinse and fill bucket with water.
DURATION OF TAP USE [Frequency 3] Tap opened again to rinse cloth but closed properly this time. Glasses sprayed individually with spray nozzle. Nozzle not kept open while moving from one glass to another.

### ***Comparative analysis of kitchen activities versus recommended guidelines***

Comparisons of tap use during general kitchen activities are made to the points presented in Table 1. When referring to point 1.1 about educating staff and displaying information, although not part of this review, but dealt with in the research, it was observed, during this study, that the occurrence of hand washing posters was only evident in one of the restaurants. Furthermore, a poster on dishwasher packing was seen three times within all the restaurants. Staff did not, however, follow instructions, as they incorrectly packed the machine before switching it on. This observation ties in with point 1.10, which is the recommendation to ensure the dishwasher is full before switching on. Similarly, points 1.2, do not throw away unsalted water after it has been used in cooking, 1.3, re-use water from ice buckets, 1.7, plan ahead and defrost items in refrigerator and not in water, 1.8, rinse dishes in a basin or tub with basin and, 1.9, do not rinse items individually but rather in a basin with water, are not discussed in this review but reported on as the tap was left running whilst these activities were being performed. Items were defrosted in a basin with water and other food items were rinsed under running water into the same basin. Although catching the running water in an already full basin can be seen as recycling, it is not the common and correct practice to defrost food in water and allow the water from rinsing items or food to fall into the same basin. Furthermore, ice in ice buckets and glasses were through down the drain and not recycled in any way.

When comparing the results of hand washing activities to the recommendations made by the industry on how to save water, there is a clear indication that the suggestions are not all necessarily being applied completely in the day-to-day kitchen activities in restaurants. The advice of asking for assistance from others (point 1.4) during hand washing did not occur. However, the practice of rinsing hands under a running tap, even though the water was caught and reused, occurred nine times. The question is whether the way in which the water in the observed restaurants was reused is correct, as the soap and water from the hand washing process fell into the basin where food items were defrosting. The recommendation of installing motion

sensors (point 1.11) or low flow taps was not evident but similarly, a knee mechanism was available during the hand washing process. There were contradictory actions as some staff members took the soap first before using the knee mechanism, whilst other staff members depressed the knee mechanism to have constant running water during the hand washing activity, thereby wasting a lot of water. The recommendation of taking soap first from the dispenser before washing hands was evident and this contributes to water saving. The recommendation to close the taps while lathering soap on hands and during other activities did, however, occur but not as frequent and consistent as required. Some kitchen staff applied these habits whilst others did not. The recommendation to re-use water used for hand washing again (point 1.5) was not seen during the observations. Water had only been recycled in the basin with other items inside. However, it was noted that some staff did wipe their hands with a cloth and during certain activities, use gloves to minimise the amount of hand washing required. Contradictory results occurred when taking into consideration the recommendation to close the taps properly (point 1.13). It was noted that some kitchen staff walked away from activities without checking the taps, while some ensured the tap was properly closed before walking away. It can, however, be noted that the number of times the tap was not closed properly definitely leans towards water wastage as the frequencies ranged from 24 times compared to water-saving frequencies of 12 times of taps not being closed properly.

## Discussion

It is evident in the results that the amount of water used within the restaurant kitchen remains high, with usage across all the activities from pre-preparation, cooking, hygiene, and service. Moreover, results reported point towards water wastage, especially during tap use, as frequencies are more recurrent when using a tap for different kitchen activities and not necessarily during the hand washing process only. Recommendations advertised require that the tap be left closed during activities. Although this was evident amongst some kitchen activities, it was very minimal though as the frequencies towards water saving were less. It remains critical for staff to be made aware of how certain procedures or activities need to be done, and the use of water needs to be monitored and controlled to avoid wastage. Similarly, proper information may assist with certain activities in the kitchen, especially to ensure reduction of water wastage. The use of information posters for kitchen activities and hand washing was not evident amongst the restaurants. The question remains whether the presence thereof would have contributed to more water saving frequencies, as creating awareness may contribute to behavioural change, as recommended by Pragle et al. (2001). The opposite occurred during the observations, however for the activity of hand washing. Although running the tap can cause wastage, staff were performing the actions as advised, which is to wash hands under a running tap. The principle of opening the tap first and then taking soap can be indicative of water wastage and it remains better practice to rather open the tap only when required. Not closing the tap whilst washing hands also occurred frequently. The results reflect that information advertised on social media, television, and radio may be contributing to change amongst kitchen staff as recommendations are adhered to most of the time. However, consideration needs to be made regarding the amount of detail to be placed within the recommendations as well as the type of information presented on posters. By creating awareness using the correct words and images, coupled with incentives to minimise the wastage of water (Aydin, Deniz & Kiraz, 2017) may have a beneficial response to promoting water saving practices within restaurant kitchens.

## Conclusion

It may be presumed that the idea of water loss and water scarcity is not evident in all individuals as some attempted to save water through their activities, whilst others did not. This may, however, only be assumed as we are not aware of the staff surroundings, demographics, and possible socio-economic status. Although kitchen staff has some form of awareness of correct hand washing activities, wastage activities during various kitchen activities are still occurring more frequently especially when focusing on the task of tap use, which is a point whereby water is obtained in kitchens. Hand washing may have been done incorrectly in a few observations, but measures were taken to try to save water in some instances by kitchen staff. Water saving awareness still needs to be encouraged so that water saving activities occur repeatedly amongst some staff members within some restaurants, but more consistent and throughout, especially when staff is under pressure during the busiest times in the kitchen. The results highlight the importance of posters, training and information needed within the industry to clearly communicate water saving practices. Management needs to lead by example and enforce stricter rules and policies. Practical training can assist in creating change with behaviours. Although some studies may reflect negatively on the correlation between visible information and behaviour change, attempts must still be made to encourage water-saving behaviours. Continuous and repetitive awareness of the situation and the implications of waste can modify behaviours one step at a time. Any positive behavioural changes will contribute to sustainable use of water, and this will assist to reach the sustainable development goals by the year 2030.

Recommendations for future research include assessing the knowledge and awareness of kitchen staff in comparison to actual behaviour, determining the impact of posters on water usage in kitchens and the amount of water usage and wastage taking place in restaurants. Further research can focus on different organisations within the food industry and not necessarily only restaurants. With water scarcity being a reality, how will water restrictions affect restaurant food production and specifically hygiene? The research was conducted one year prior to the Covid-19 pandemic, which raises possibilities to research how staff is washing hands, as campaigns during Covid-19 have emphasised hand washing and sanitising. A repetition of this study may lead to interesting finds on how the pandemic changed the hand washing awareness of kitchen staff. Although general guidelines can guide an individual, work-specific focus needs to take place to achieve water saving in the restaurant sector.

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