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Degree of bacterial contamination in barbershops using hair dryers in Riyadh

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ABSTRACT

Barbershops provide areas for the growth and transfer of bacterial pathogens and thereby have an impact on public health. Barbershops are ideal places for the interactive spread of infections, including community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA). Here, the work determines the degree of bacterial contamination of hair dryers used in barbershops. The samples were collected in the city of Riyadh, the Kingdom of Saudi Arabia on March 2019. Significant bacterial contamination was seen, with total bacterial count increasing when the hair dryers were run for 20 instead of 10 s. The study shows a high level of bacterial contamination barbershops using hair dryers, with MRSA being isolated in some. The results suggest that high quality filters should be used inside hair dryers and filters, and these should be cleaned frequently.

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1. Introduction

Staphylococcus aureus is an opportunistic pathogen occurring in a wide range of animals, including humans (Abdalla et al., 2012, Corvaglia et al., 2010, David and Daum, 2010, Haque et al., 2011, Shearer et al., 2011). Antibiotic-resistant strains are of particular concern (Perveen et al., 2013, Hena and Sudha, 2011, Rajaduraiipandi et al., 2006, Al-Anazi, 2009) as they can cause fatal infections in hospitals and other community health settings (Al-baidani et al., 2011, Bannerman and Peacock, 2007, Moussa et al., 2011, Okwu et al., 2012, Peters et al., 2013). Community-acquired MRSA (CA-MRSA) was initially found to be confined to infections of the skin, soft tissues and bones (Alaklobi et al., 2015). The prevalence of MRSA in Saudi Arabia was detected a decade ago, and was found to vary between regions in the Kingdom (Adam and Abomughaid, 2018, Islam and Moore, 2002, El Amin and Faidah, 2012, El-Mahdy et al., 2018).

Daily interactions between people are the most obvious way in which pathogens are spread in communities (Kramer et al., 2006). Fomites, such as hair dryers, scissors, combs and other tools used

barber shops act as important pathogen-transmitters in barber shops (Kramer et al., 2006, Stanley et al., 2019, Adeleye and Osidip, 2004, Barn and Chen, 2011), where every service can lead to the imposition of readily infectable skin-breaks (Stout et al., 2011). Hairdressers, like barbers and their customers, are regularly exposed during their services to contamination by a wide range of both bacteria, some of which are potentially pathogenic (Tharmila et al., 2012, Enemuor et al., 2013, Onajobi et al., 2015, Janmohammadi et al., 2016, Sekula et al., 2002).

The prevalence of bacteria on tools used in barber shops and beauty salons has been widely reported upon (Stanley et al., 2019, Enemuor et al., 2013, Janmohammadi et al., 2016, Stanley et al., 2014, Dadashi and Dehghanzadeh, 2016). In Saudi Arabia, the prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) is growing (with an average MRSA rate as high as 38%) (Aljeldah, 2020, Adam and Abomughaid, 2018). The prevalence of MRSA in Saudi Arabia differs markedly from region to region. In Central areas including Riyadh city, the prevalence of MRSA is recorded at 32% (Adam and Abomughaid, 2018, Al-Hamad et al., 2018, Al-Zahrani et al., 2019), which is not surprising, since Riyadh is the largest city in the Kingdom and has a much higher population density compared to other cities. Here, the work reports on the involvement of the use of hair dryers in spreading bacteria in barber shops located in Riyadh.

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2. Materials and methods

2.1. Collection of samples

Nine hair dryers used in the barbershops were employed to evaluate the prevalence of bacterial contamination in Riyadh, Saudi Arabia. The samples were collected in the city of Riyadh, the Kingdom of Saudi Arabia on March 2019. The hair dryers were turned on for 10 and 20 s and the air emitted was collected on the surface of a range of agar media contained in Petri dishes. The petri plates were then incubated for 48 h at 37 °C, and a total number of bacteria was determined.

2.2. Identification of bacterial isolates

Traditional, non-molecular, methods were used, including Gram staining, colonial morphology and biochemical tests (Murray et al., 2003). MRSA were confirmed using CHROM agar MRSA medium (indicated by the presence of pink, instead of blue colonies) and confirmed using the Vitek2 System. Incubation was for 18 to 24 h at 30 °C.

2.3. Statistical analysis

Three replicates were used throughout and Duncan's test by using SPSS software (SPSS Inc., USA) was carried out to determine the level of significance between means of samples (Steel and Torrie, 1980).

3. Results

Total counts of bacteria, *Staphylococcus* spp. and *Staphylococcus aureus* were determined in barber shops, using hair dryers, over different time periods (10 and 20 s). The results (Fig. 1) show a significant difference in the total bacterial colonies isolated from three barber shops when hair dryers were used. The total bacterial count found in barber shop (B) was higher than that in the other two (A and C). The total bacterial count was higher when the hair dryers were turned on for 20 s compared to 10 s in all of barber shops sampled. Fig. 2 shows that contamination with *Staphylococcus* spp. bacteria was higher in barber shops (A and B) compare barber shop (C). High bacterial contamination in all barber shops was a cause of prevalence of *Staphylococcus aureus* present in hair dryers used (Fig. 3).

4. Discussion

The results of this study agree with finding of a previous study which indicated the prevalence of bacterial colonies when hand air-dryers were used in washrooms (Alharbi et al., 2016). Numer-

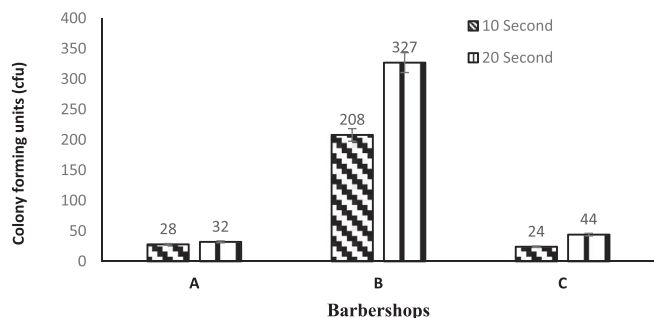


Fig. 1. Total bacterial colonies isolated in barber shops in which hair dryers were used.

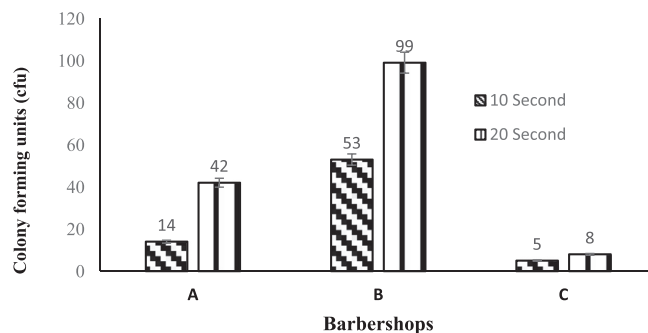


Fig. 2. *Staphylococcus* spp. bacteria isolated in barber shops in which hair dryers were used.

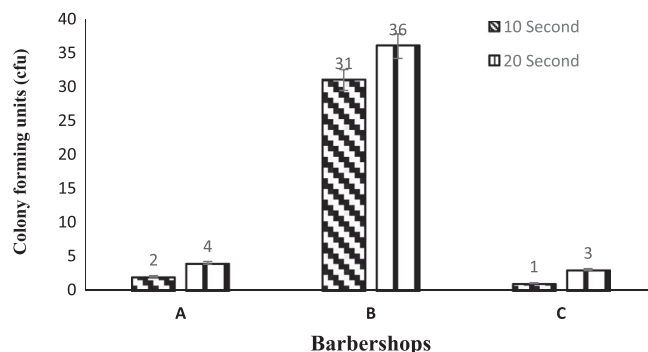


Fig. 3. *Staphylococcus aureus* bacteria isolated in barber shops in which hair dryers were used.

ous previous studies have also confirmed the presence of bacterial contamination on tools used in barber shops (Stanley et al., 2019, Enemuor et al., 2013, Janmohammadi et al., 2016, Stanley et al., 2014, Enemuor et al., 2012, Naz et al., 2012, Dadashi and Dehghanzadeh, 2016). Table 1 shows the prevalence of MRSA in barber shops where hair dryers were used. The results using CHROM agar MRSA medium show that MRSA bacteria were isolated in barber shop A, but not from the other shops.

Several studies have shown that there is a significant occurrence of MRSA in Saudi Arabia (Adam and Abomughaid, 2018), with Baddour et al. (2007) reporting that the rate of MRSA in hospitals in Riyadh is between 12% and 49%. Nasal load of MRSA to the Saudi people is estimated to be about 25% of all isolated *S. aureus* strains (Abou Shady et al., 2015). This percentage is very high when compared to countries such as India (incidence of 3.9%) (Chatterjee et al., 2009), and the USA (incidence 1.5%) (Sun et al., 2017). The high prevalence of MRSA is likely inappropriate use of antibiotics and to the extensive movement of people to Saudi Arabia for purposes of migration and pilgrimages.

The occurrence of CA-MRSA appears to be growing globally and is becoming a significant public health issue both in the general

Table 1
Prevalence of MRSA bacteria in barber shops in which hair dryers were used.

Barber shops	Using time	MRSA bacteria
A	10 sec	–
	20 sec	–
B	10 sec	+
	20 sec	+
C	10 sec	–
	20 sec	–

(–) No colonies (+) Colonies.

population and in hospitals. Barbershops are perfect places to transmit diseases interactively, including CA-MRSA. The aim of current study was to determine the degree of bacterial contamination of hair dryers used in barbershops in the Kingdom of Saudi Arabia, Riyadh, on March 2019. The results show that *Staphylococcus aureus* and MRSA bacteria were isolated from barber shops in which hair dryers were used. Such use therefore, has the potential to spread bacterial colonies during normal practices of hairdressing and client shaving. The prevalence of MRSA in Saudi Arabia including barber shops is attributed to the excessive use of antibiotics and the large migration and pilgrimage movements by people to the country. Based on the findings of this study, the research suggests the use of high-quality filters inside hair dryers and that the filters are cleaned regularly.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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