

Isolation of MRSA from Drinking water Supplies in Al-Anbar Province, Iraq

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Abstract

This study was aimed to isolate MRSA from water supplies from different places in alanbar province, fifty water samples were cultured on nutrient, macConkey and blood agars then subcultured on MSA and Staph 110, then gram stain and biochemical test done to confirm this bacteria. Then antibiotic susceptibility test were done on *S. aureus* by using different antibiotics including Methicillin, erythromycin, Doxycycline, Sulfa-trimethoprim, penicillin, chloramphenicol, ciprofloxacin.

The results showed that 12 (24%) samples were diagnose as *S. aureus*, these were showed complete resistance to methicillin, erythromycin, Doxycycline and showed different percent for resistance to other antimicrobials that used.

In conclusion, the MRSA were isolated from drinking water in significant percentage and this strain of bacteria were showed higher resistance to antibiotics.

Key words: MRSA, drinking water, Antibiotic.

Introduction

The WHO reported that MRSA was an important pathogenic bacteria causing high infections that was initially detected in 1961 & became a main threats to the public health (1).

In a study of Chen et al. (2), they reported that above two million of MRSA infection cases around the different countries in the world producing human death. As described in the UK, above five thousands deaths each year were showed to be linked with MRSA, although in Netherlands, MRSA has been found to be causes for in excess of twenty percent of all infections for MRSA (3). In Europe, it has been reported that MRSA was responsible for above 170,000 infections each year, consistent to forty four percent from all infections linked to the health care (4).

Staphylococcus aureus is an environmentally widespread but it is found chiefly on the skin as well as mucous membranes of human and animals. *Staphylococci* are sometimes identified in the GIT and has been discovered in a sewage. *S. aureus* can become free by human direct contact with the water environments for example the pools for swimming as well as fun waters. It has been also identified in a drinking water supplies (5), there is an indication of spread through the drinking of such water. While *Staph. Spp.* are somewhat resist to residuals chlorine than the *E. coli*, their occurrence in water is restricted by conventional therapy as well as disinfection procedures (6).

This study aimed to isolate MRSA from human water supplies and detection of resistance to different antimicrobials by using antimicrobials sensitivity test.

Materials and Method

A Fifty drinking water specimens were taken from a different places found in Al-anbar province (Fallujah, Heet, Ramadi, Ana, Rawa, Al-qaim, Saqlawya, Garma), these were cultured on primary media (nutrient, macConkey, blood agars), then were subcultured on other media such as mannitol salt agar and Staph 110, then gram stain as well as biochemical tests were done including catalase, oxidase as well as coagulase (7).

The antibiotics sensitivity test were done according to Bauer et al. (8) by using different antibiotics including Methicillin, erythromycin, Doxycycline, Sulfa-trimethoprim, penicillin, chloramphenicol, ciprofloxacin.

Results and Discussion

The current results were showed detection of 12 isolates of MRSA from water specimens (Table 1, Fig. 1&2).

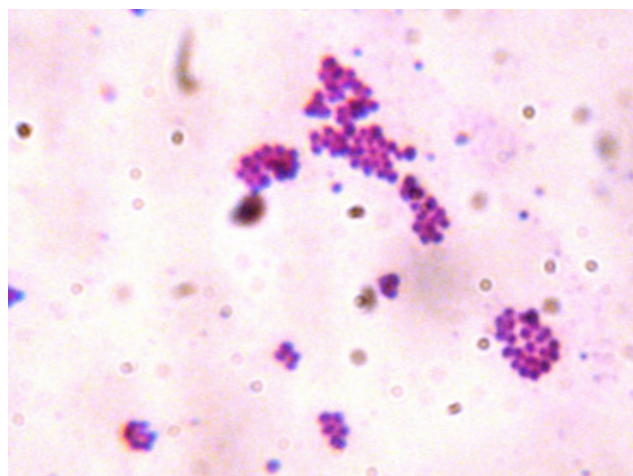
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Table 1- Number and percentages of MRSA from different location

Location	Number of MRSA	Percentage (%)
Fallujah	1	8.33
Ramadi	2	16.66
Heet	1	8.33
Ana	1	8.33
Rawa	0	0
Al-qaim	1	8.33
Saqlawya	4	33.33
Garma	2	16.66
Total	12	24%

**Figure -1- S. aureus on MSA (left)****Figure -2- Gram positive cocci**

The WHO reported that above 80% of all illness as well as the diseases on the world is made by insufficient hygiene, contaminated water or unreachability of water & at least five million deaths occur in each year which attributed to the water-borne illnesses (9). These results were in agreement with results of (10) who isolated *S. aureus* from the water provisions. Also, these similar to results of another study in Ghana that showed *S. aureus* was detected from about 64% of the specimens, with about 34.38% from well water supplies, 32.81% from hole supply & 31.25% from the tap water (11).

A study of Salim et al. (12) in Iraq found that *Staphylococcus aureus* were isolated from bottled drinking water during storage for one year at 18°C. Also, in Nigeria (13) isolated *S. aureus* from a drinking water. Moreover the bacteria that resist antibiotic were upper in the tap water than in treated water (14). Additional studies have also recognized *S. aureus* that are MDR in seaside societies in their tap water as well as fresh water (15).

The results were disagree with a results of Hillo (16) who reported that *S. aureus* not detected in drinking water in Albasrah city.

The present results of antimicrobial sensitivity test for presumptive *S. aureus* (12 isolates) showed complete resistance to methicillin, erythromycin, Doxycycline and showed different percent for resistance to other antimicrobials that used (Table 2, Figure 3).

Table 2 Antimicrobial susceptibility test for S. aureus

Antimicrobials	Resistance (%)	Sensitive (%)
Methicillin	12 (100)	0
erythromycin	12 (100)	0
Doxycycline	12 (100)	0
Sulfa-trimethoprim	5 (41.7)	7 (58.3)
penicillin	10 (83.3)	2 (16.7)
chloroamphenicol	3 (25)	9 (75)
ciprofloxacin	4 (33.3)	8 (66.7)

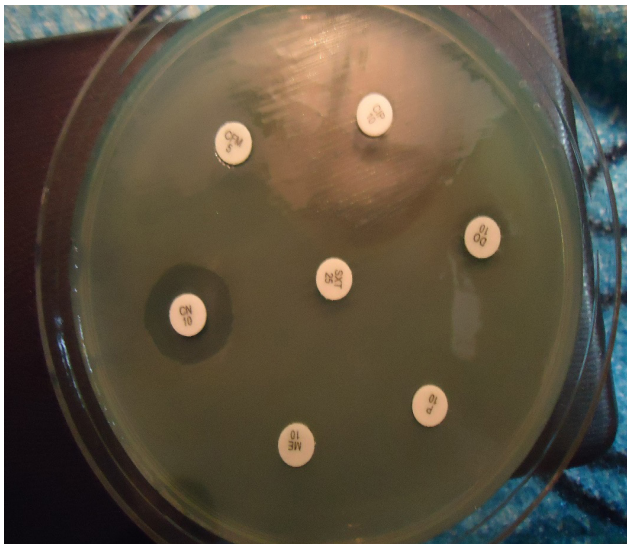


Figure 3- showing MRSA on Muller hinton agar

The current results were in agreement with results of many studies, Younis et al. (17) reported that 96.6% of *S. aureus* isolates were resistant to penicillin. Shi et al. (18) reported that 87.6% of isolates were resistant to penicillin. Abera et al. (19) recorded that 94.4% of isolates were resistant to the penicillin. Vanderhaeghen et al. (20) reported that all isolates (118 *S. aureus* isolates) in their study were resistant to tetracycline. Tiao (21) found that none of the 20 *S. aureus* isolates tested in her study carried the *mecA* gene and one showed methicillin resistance phenotypically. Turutoglu et al. (22) stated that out of 18 *S. aureus* isolates, 15 were typically resistant to the methicillin but didn't carry the *mecA* gene.

Also, these strains presented greater amounts of resistance to the family of macrolides especially erythromycin as reported by (23).

The incidence of genes that are responsible for antibiotic resistance in a drinking water is of special concern because of the amount of persons as well as animals who are possibly affected by consuming contaminated water that contains the bacteria which are antibiotic resistant and can transmit antibiotic resistance to the usual bacterial flora in the bowels of humans as well as animals.

The presence of resistance for most antibiotics that are used may be due to random usage of antibiotics and usage of drugs by incomplete course, these may lead to what is called multi drug resistance bacteria.

It has been concluded that MRSA isolated from a water supplier in a significant number and this has been resistant to multiple antibiotics.

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both environmental and health and higher education and scientific research ministries in Iraq

Conflict of Interest: The authors declare that they have no conflict of interest.

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