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# Prevalent of Staphylococcus aureus from Sachet Waters Sold in **Different Areas of Jos Terminus Market, Nigeria**

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Staphylococcus aureus is an important human pathogen that causes wide range of infectious diseases both in nosocomial and community settings. The Gram-positive pathogen possess virulence factors that facilitate it to establish infections in the hosts. When a "water for life" is contaminated with infectious bacteria such as *Staphylococcus aureus* then, there may be public health challenge in the area. In this study Samples of Sachet water of different companies' ware purchased, marked E, T, C and R and examined for the presence of staphylococcus aureus. Total of 80 sachet waters were examined and a prevalence rate of Staphylococcus aureus 5(25.00%) was recorded. The study revealed that sachet water (E) has the highest prevalence of 15.00%, followed by T (5%) and C (5%) and R had the least prevalence with 0.00%. It was discovered that a Prevalence rate of Abuja market terminus recorded 1(5.00%) while that of Ahmadu Bello way has the highest prevalence of 2(10.00%), Yan Taya market 1(5.00%) and railway 1(5.00%). This shows that S. aureus can be isolated from sachet waters. Though the sachet eaters had NAFDAC numbers, it is advisable to review and quality control such sachet water companies regularly because of Staphylococcus aureus and other public health infectious agants. The populace should equally be careful with the type of waters they drink.

## **INTRODUCTION**

Staphylococcus aureus or "staph" is a bacteria found on human skin, in the nose, armpit, groin, and other areas. While these germs don't always cause harm, they can make someone sick under the right circumstances. S. aureus is the leading cause of skin and soft tissue infections, such as abscesses, boils, furuncles, and cellulitis (red, swollen, painful, warm skin). S. aureus germs can also cause more serious infections, such as pneumonia, bloodstream infections, endocarditis (infection of the inner lining of the heart chambers and heart valves), and bone and joint infections [1].

S. aureus is spread by touching infected blood or body fluids, most often by contaminated hands. Anyone can develop a S. aureus infection, although certain groups of people are more likely than others. This includes people with conditions such as: diabetes, cancer, vascular disease, eczema, lung disease, and people who inject drugs. Patients who are hospitalized in intensive care units (ICUs), patients who have undergone certain types of surgeries, and patients with medical devices inserted in their bodies, such as central lines and catheters, are at greater risk of a more serious S. aureus infection. People who often visit healthcare facilities and nursing home residents are also at an increased risk [2].

Staphylococcus aureus is an important human pathogen that causes wide range of infectious conditions both in nosocomial and community settings. The Gram-positive pathogen is armed with virulence factors that facilitate to establish infections in the hosts.

The organism is well known for its ability to acquire resistance to various antibiotic classes. The emergence and spread of methicillinresistant S. aureus (MRSA) strains which are often multi-drug resistant in hospitals and subsequently in community resulted in significant mortality and morbidity. This should be taken serious by all key players in water services industry to reduce drug resistant organisms as advocated by WHO [3]. Anyanwu [4] had listed Staphylococcus aureus as one of the major drug resistant bacteria found in water in Nsukka, Nigeria.

In Jos, there is a common slogan, "water for life" as advertised regularly by the State Water Board. Water indeed gives life as the body needs and contains more water than ever. This has made majority of the populace to get interested more in the sachet waters because of low cost, accessibility and affordability. Poverty, low income and market environment where profit is of high interest has provided more market for sachet water companies and marketers around the Terminus market of Jos. Water serves human as nutrition, product for food production, for maintenance of personal hygiene and prevention of diseases no wonder is the most abundant substance in nature occupying up to 70% of the earth [5, 6]. Educational institutions are not left out with consumption of sachet water consumption as studied in Imo State, Nigeria [7].

The aim of this study was to isolate *staphylococcus aureus* from different sachet water sold in Jos terminus market with objectives to know Terminus areas that had high prevalence of *Staphylococcus aureus* contaminated water and to discover which of the sachets water had the highest prevalence.

## MATERIALS AND METHODS

## Study Area

The study was carried out in different areas of terminus market also known as Jos main market, located in Jos North, it is the largest market in Plateau State Nigeria. Also, it is the largest indoor market in West Africa, where all sorts of commodities are sold.

#### **Study Period**

The samples of sachets water collected from terminus market and analysis carried out within 5th-25th July, 2021.

### Sample Collection

80 samples of sachet waters 20 each of marked E, T, C and R where collected from different areas in terminus market. 20 from Yan Taya Junction, 20 from Abuja market, 20 from Ahmadu Bello way, and 20 from railway terminal into different sterile polythene bags. Samples were taken to Microbiology Laboratory in Federal School of Medical Laboratory Technology for analysis.

#### **Sample Analysis**

From the marked samples, 5ml of water of E, T, C and R were picked using a clean pasture pipette. It was added to a clean centrifuge tubes which have been labelled accordingly. It was centrifuged for 5 minutes and the supernatant was discarded. Using a sterilize wire loop the sediment was picked. It was placed on blood agar to give a confluent growth prepared, cultured and examined in line with Cappuccino and Sherman [8].

Culture plates were examined macroscopically for colonial characteristic of the isolated organism. The morphological appearance of the isolated organism was discovered found to include: 0.1 size, round shape, smooth edge, mucoid in consistency, no capacity, no pigment strand on blood agar as can be seen on the plate 1 below (**Fig. 1**).



Fig. I. Staphylococcus aureus on blood agar plate.

Smear was made and Grams staining technique carried out according to Cappuccino and Sherman, [8] and examined using  $\times 100$  objective of the microscope. Gram staining examination, Indole test, catalase test and coagulase test were used to confirm *S.aureus* according to Cappuccino and Sherman, [8]. Coagulase test was used to differentiate *Staphylococcus aureus* (positive) from Coagulase Negative *Staphylococcus* (CONS). Coagulase is an enzyme produced by *S. aureus* that converts (soluble) fibrinogen in plasma to (insoluble) fibrin because *Staphylococcus aureus* produces two forms of coagulase, which are bound or free coagulase. The prevalence of *Staphylococcus aureus* detected in the sachet water was calculated by Number of sachets that

contained *Staphylococcus aureus* after examination divided by number of sachets examined multiplied by 100.

## RESULTS

The prevalence of *staphylococcus aureus* in sachets water (Fig. 2) obtained at different areas of terminus was 5 (25.00%) after biochemical tests such as coagulase and catalase test as shown in **Table 1**. In the Abuja market terminus only sachet water (E) gave a prevalence rate of 1 (5.00%) while the prevalence of sachet water (T), (R) and (C) was nil. In the Ahmadu Bello way terminus, only sachet water (E) gave a prevalence rate of 2(10.00%) while the prevalence of sachet water (T), (C) and (R) was nil. On the other hand, in the Yan Taya market terminus, only sachet water (E) (C) and (R) gave zero prevalence. In the Railway terminus, both sachet water (E) and sachet water (C) gave a prevalence of 1(5.00%) while sample (T) and (R) gave zero prevalence rate (**Table 1**).



Fig. 2. Gram positive sachet water sample Mx100

 Table 1. Prevalence of Staphylococcus aureus isolated from different places in terminus market as confirmed by biochemical tests.

Market	No.	No	No.	Prevalence
	Examined	Negative	Positive	(%)
Abuja Market				
Terminus	20	19	1	5
Ahmadu Bello				
way Terminus				
market	20	18	2	10
Yantaya				
Terminus Market	20	19	1	5
Railway				
Terminus Market	20	19	1	5
Total	80	75	5	25

# DISCUSSION

*S. aureus* usually acts as a commensal of the human microbiota and can also become an opportunistic pathogen. The bacteria are common cause of skin infections including abscesses, respiratory infections such as sinusitis, and food poisoning. The water as major body component can contribute to such body infection when found in drinking water.

The study revealed that Sachet waters had the presence or absence of *staphylococcus aureus* in different places in terminus up to the prevalence of 25.00%. This prevalence of 25.00% was the same with sachet water sold in Nnewi, South East, and Nigeria as shown by the studies of Ezeugwunne *e tal.*[9].

These findings shows that *staphylococcus aureus* can be isolated from different makes of sachet waters in terminus market just like studies carried out in several geopolitical zones in Nigeria [7, 10-13] including NAFDAC [14]. This study revealed that sachet water (E) has the highest prevalence of 15.00%, followed by T (5%) and C (5%) and R had the least prevalence with 0.00%. This shows the level of quality and standard way of factory processing of the Sachet waters. This also happens in other States and regions of Nigeria [7, 11-13, 15]. It is possible that the personal hygiene of the factory staff or factory environment must have contributed to the water contamination. This would help the safe water campaign of WHO [16].

## CONCLUSION

This study indicate that Staphylococcus aureus are present in Sachet waters sold around Terminus market in Jos. It is advisable for consumers to mind the type of Sachet water they patronize. The preventive measures that should be taken in other to prevent the spread of Staphylococcus aureus through sachet water include hands washing, regular disinfection and regular environmental sanitations in the factory side and possibly boiling of the sachet water by consumers.

Some of the water samples were found to be in excellent condition and others in satisfactory conditions (0.00%), efforts however should be made by the manufacturers to still improve. The NAFDAC and other agencies should follow up all sachet water producers for standard output to save lives

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### ABBREVIATIONS

NAFDAC, National Agency for Food and Drug Administration and Control

#### CONFLICT OF INTEREST

The authors have declared that there is no competing interests existing in the study.

## AUTHOR CONTRIBUTIONS

FB, ZM, and UO performed the literature search, data extraction, and statistical analysis and initial draft. SU, EM, and SN, reviewed the manuscript; UO did the final editing, formatting, and submission.

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