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Research Article

Antibacterial Activity of Some Commercial Medicated and Home Made Soaps Used in Umuahia, Abia State

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ABSTRACT

The use of commercial or locally made soap to ensure cleanliness cannot be overemphasized. The aim of the study is to analyze the antibacterial activity of some commercial medicated and locally made soap used in Umuahia. A total of 3 locally produced soaps were collected and used for this study against some clinical isolates using the agar well diffusion technique. The commercial medicated soaps showed higher antibacterial effect comparatively. Crusader soap showed the highest antibacterial activity at all dilutions (200mg/ml to 6.25mg/ml) with diameter zone of inhibition of 25mm and 10mm respectively against *Staphylococcus aureus*. On the other hand, the locally made soaps also showed some level of antibacterial activity ranging from as low as 10mm (100mg/ml) with soda soap on *Escherichia coli* to high as 18mm (200mg/ml) with Black soap on both *Staphylococcus aureus* and *Escherichia coli*. Ogbe soap produced no antibacterial activity against *Staphylococcus aureus*. Crusader soap showed equal MIC and MBC values of 6.25mg/ml for *S. aureus* while black soap and Ogbe soap had no antibacterial activity against *P. aeruginosa* but inhibited *E. coli* at 100mg/ml and 25mg/ml, respectively. In this study, the commercially produced medicated soaps showed higher levels of antibacterial activity against the test isolates (*E. coli, S. aureus and P. aeruginosa*) better than the locally produced soaps.

Keywords: Antibacterial activity, commercially medicated; local, soaps

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INTRODUCTION

Soaps play an important role in our hygiene and health, as they not only have a bactericidal effect but also remove dirt from the human body (Santos-Junior *et al.,* 2024). Homemade soap using local raw materials is an ancient method of soap making that is used in producing soaps for the family use in the olden days. Technically, soap making involves the use of sodium salts as one of the active ingredients (Pereira, 2016). There are many agricultural waste material such as palm bunch, cocoa pod, plantain peels, maize cobs, banana peels, cassava peels and others used in soap production from a mixture of vegetable oil (palm kernel oil and sheabutter) that makes the soap to have antimicrobial properties recognized in the traditional African household (Velozo, 2018). The making of soap using vegetable matter has been an age old craft. Unfortunately, the soaps made then were soft, black and smelly and corrosive to the hands. In recent times, soaps have been improved industrially into more presentable forms with trade names in the market which are present in various formulas. Triclosans, trichlorocarbamide and p-chloro-in-xynol (PCMX/chloroxylenol) are the commonly used antibacterial in medicated soaps (Maru and Lahoti, 2018). These are generally mainly contained at preservation level unless the product are clearly marked as antibacterial, antiseptic or germicidal (Londhe *et al*., 2015).

The attributes of soaps include gentleness on the skin, rich lather, protection against skin disorders (including rashes, eczema, scabies), treatment of skin infections (such as ringworm), protection of even skin tone and

smoothness of the skin (Warra et al., 2010). For generation, hand washing with soap and water has been considered a measure of personal hygiene. Hand hygiene and prevention of infection through the use of medicated soaps has been well recognized (CDC, 2012). Bacteria are of great importance with reference to health (CDC, 2012). This group of microorganism could be pathogenic or non-pathogenic in terms of their ability to cause disease/infection. Many types of microorganisms (bacteria, fungi and archea) are normally present on or in the human body without causing disease and are referred to as normal micro biota. These normal micro biota could be residential (normally present/permanent) or transient (temporary). They can be found on the surface of the skin. Transient bacteria are deposited on the skin surface from environmental sources and cause skin infections. Examples of such bacteria are *Pseudomonas aeruginosa* and *Staphylococcus aureus* (Santos-Junior *et al*. 2024). The normal skin micro biota are non-pathogenic, but could either be commensals (not harmful to their host) or mutualistic. However, resident microbes can cause disease and can enter the blood system creating life threatening diseases particularly in immune-compromised people (Dahal and Chaudhary, 2018).

A large number of chemical compounds have the ability to inhibit the growth and metabolism of microorganisms. Of the many group of chemicals used to reduce or destroy microbes important groups includes hydrogen, phenol, soaps, detergent, ammonia compounds, alcohols, heavy metals, acids (Santos-Junior *et al*. 2024). The use of soap in cleaning parts of the body (skin) could stand as a defense against bacteria and other pathogens that may cause skin infection and even deadly communicable diseases (Leitzke *et al.,* 2021).

MATERIALS AND METHODS

Sample Collection

The commercial medicated soaps Crusader, Dettol and Zee were purchased from pharmacy and cosmetic stores in Umudike, Abia state which are designated distributers of these products. The batch numbers, expiry dates and the presence or absence of the manufacturer's seal was confirmed to authenticate the originality of the products. The locally made soaps black soap. Ogbe and soda were obtained from local dealers in Ndoru market Ikwuano L.G.A., Abia State.

Test Organisms

Isolates of *Pseudomonas aeruginosa, Escherichia coli and Staphylococcus aureus* used in the study were obtained from the Microbiology laboratory, Federal Medical Center Umuahia and confirmed by Gram's staining method and biochemical tests (Cheesebrough. 2006).

Preparation of Soap Samples

Sterile blade was used to scrape 1g (1000mg) each of the soap samples. The quantity was weighed using a weighing balance and dissolved in 5ml of sterile distilled water giving a concentration of 200mg/ml. Double-fold dilutions were further made from the initial concentration of 200mg/ml as follows: 100mg/ml, 50mg/ml, 25mg/ml,12.5mg/ml and 6.25mg/ml respectively.

Antimicrobial Susceptibility Testing Agar-Well Diffusion Method

The susceptibility of the test organisms to the soaps was determined using agar-well diffusion method (Ndukwe *et.al*, 2008: Aliyu *et.al*, 2009). Nutrient agar plates were prepared for the three isolates. Six wells were made on each plate using a sterile cork borer of 6.25mm diameter and 0.3ml of each concentration of the soap suspension was transferred into each of the six (6) wells and labeled appropriately. The soap suspension was allowed to diffuse after which the surface of the nutrient agar plates were inoculated using a sterile cotton swab. It was ensured that the plates were appropriately labeled with respect to the isolates, different concentrations of the soap sample and type of soap.

The plates were incubated at 37°C for 24 hours after which they were observed for diameter zones of inhibition around the wells. The zones of inhibition were measured and recorded.

Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) Test

Test tubes containing the dissolved soap samples at varying concentrations (200mg/ml, 100mg/ml, 50mg/ml, 25mg/ml, 12.5mg/ml and 6.25mg/ml) were labeled with respect to the different test organisms (*S. aureus, E.coli, P. aeruginosa*) and soap type (Crusader, Dettol, Zee, Black soap, Ogbe, Soda). Each test organism was inoculated into the labeled tube: the tubes were incubated at 37°C for 18-24 hours. Each concentration containing the organism were subcultured on nutrient agar plates after incubation for 24 hours at 37°C. The MIC was from the test tubes that showed no visible growth after 18-24 hours of incubation. The MBC was taken as the lowest concentration resulting in no visible growth after sub-culturing on the nutrient agar plate.

RESULTS

This study evaluated the antibacterial activity of six soap samples (*Crusader, Dettol, Zee, Black soap, Ogbe, Soda*) against *Staphylococcus aureus*, *Pseudomonas*

aeruginosa, and *Escherichia coli*. The results as presented in Table 1 revealed that Crusader demonstrated the strongest inhibitory effects across all isolates, maintaining activity even at low concentrations (6.25 mg/ml for *S. aureus*). Dettol showed moderate to high efficacy but exhibited reduced activity at lower concentrations (e.g., no inhibition for *E. coli* at ≤12.5 mg/ml). Zee, Black soap, and Soda displayed limited or no inhibition at concentrations ≤25 mg/ml for most isolates while Ogbe consistently showed no inhibitory activity against any isolate, even at the highest concentration (200 mg/ml).

Key findings from the MIC/MBC values (Table 2) show again that Crusader had the lowest MIC/MBC values for all isolates (MIC/MBC = 6.25 mg/ml for *S. aureus*), indicating potent bactericidal effects. Dettol showed variable efficacy: it was effective against *S. aureus* (MIC/MBC = 12.5 mg/ml) but less so against *E. coli* (MIC/MBC = 50 mg/ml). Zee, Black soap, and Soda required higher concentrations (MIC ≥25–50 mg/ml) to inhibit or kill bacteria, with some gaps in activity (e.g., no MBC data for Zee against *P. aeruginosa*). Ogbe showed no measurable MIC/MBC against *S. aureus* or *P. aeruginosa* and required 100 mg/ml to inhibit *E. coli*.

Table 1: Diameter of zones of inhibition (mm) of soap samples against the test isolates

Isolates	Soap	Concentrations (mg/ml)					
		200	100	50	25	12.5	6.25
S. aureus	Crusader	25	20	15	10	10	10
	Dettol	26	20	18	18	10	0.0
	Zee	18	10	0.0	0.0	0.0	0.0
	Black soap	18	15	0.0	0.0	0.0	0.0
	Ogbe	0.0	0.0	0.0	0.0	0.0	0.0
	Soda	16	12	0.0	0.0	0.0	0.0
Pseudomonas aeruginosa	Crusader	20	15	15	15	10	10
	Dettol	15	10	10	8.0	0.0	0.0
	Zee	15	0.0	0.0	0.0	0.0	0.0
	Black soap	15	0.0	0.0	0.0	0.0	0.0
	Ogbe	12	0.0	0.0	0.0	0.0	0.0
	Soda	15	12	0.0	0.0	0.0	0.0
E. coli	Crusader	28	25	20	18	10	10
	Dettol	25	20	18	16	0.0	0.0
	Zee	15	13	10	0.0	0.0	0.0
	Black soap	18	15	0.0	0.0	0.0	0.0
	Ogbe	15	0.0	0.0	0.0	0.0	0.0
	Soda	16	10	0.0	0.0	0.0	0.0

Table 2: MIC and MBC of the soap samples (mg/ml) against the test isolates

Isolates	Soap	MIC	MBC
S. aureus	Crusader	6.25	6.25
	Dettol	12.5	12.5
	Zee	50	50
	Black soap	25	50
	Ogbe	-	-
	Soda	50	50
P. aeruginosa	Crusader	25	25
	Dettol	25	25
	Zee	-	-
	Black soap	-	-
	Ogbe	-	-
	Soda	50	50
E. coli	Crusader	25	25
	Dettol	50	50
	Zee	25	50
	Black soap	25	50
	Ogbe	100	100
	Soda	50	50

DISCUSSION

Results from the investigation revealed that most of the medicated soaps tested have varying degree of antibacterial activity as shown by the inhibition of the growth of the test organisms. Majority of the commercial medicated soaps (Crusader, Dettol and Zee) have demonstrated satisfactory effect in terms of the antibacterial activity. As most of these industrially made medicated soaps have been technically improved with regards to the production technique, incorporation of some antimicrobial agents during preparation and so on, they tend to have more antibacterial effects that the locally made ones which are said to be effective in preventing or treating several skin infections.

The locally made soaps: Black, Ogbe and Soda soaps indicated a minimal degree of antibacterial activity against the test isolates with Ogbe soap producing least activity. Various factors such as the mode of preparation, inappropriate quantity of ingredients used or basically factors arising from the producers themselves could contribute to the minimal antibacterial activity of these local soaps. The results from this study showed that the activity of these locally made soaps is in line with the result of the study conducted by Kuril *et.al*. (2020) on the antimicrobial activity of Sabulun-salo a local traditional medicated soap. From their findings, the locally made soap except Ogbe also exhibited activity on *S. aureus* and *E. coli* as also seen in the result of this study.

Furthermore, findings of this research showed Crusader soap as being the most effective commercial soap on all the test bacterial isolates as indicated by the large zone diameter of inhibition produced. This agrees with the findings of Obi (2014) where Crusader soap was found to possess the best antibacterial activity in his study on the antibacterial activities of some medicated soaps on selected human pathogens. This activity of Crusader soap and some other medicated soaps used in the present study was explained according to Jacob *et al.* (2019) as well as Ahmed *et al.* (2021) to be due to the production technique and the incorporation of some antibacterial agents and potassium mercuric iodide during production hence their potential to eliminate these microorganisms.

Moreso, in a similar work carried out by Leitzke *et al.* (2021) as well as Londhe et al (2015), on the antimicrobial activity of medicated soaps commonly used by residents of Tanzania, dettol and some other soaps not used in this study showed lower of no activity on the test isolates. This is in contrast with the result of this present study where Dettol showed considerable activity as evident by the zone diameter of inhibition produced. Finally, the locally made Black soap and Zee (a commercially medicated soap) showed almost similar activity at the same concentration of 200mg/ml on all the test isolates. This finding was in agreement with the submission of Abdulmalik *et al.* (2023). Zee is a modified form of the locally made soap and differs from Black

soap due to the inclusion of antibacterial agent hence its higher activity on *E. coli*. However, Black soap showed the highest activity compared to the other locally made soaps and this could be attributed to the presence of the cocoa pod/ plantain peel in which its antibacterial activity has been explained by Srinivasan (2016).

CONCLUSION

In this study, the commercially produced medicated soaps showed higher levels of antibacterial activity against the test isolates (*E. coli, S. aureus and P. aeruginosa*) better than the locally produced soaps which are widely believed to have antimicrobial activity in the treatment of some skin infections.

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