An International Multidisciplinary Journal
अनन्यशास्त्रम्
(A Unique Treatise of Knowledge)
ISSN:3049-3927 (Online)
Volume: 01 | Issue: 02 | August: 2025
Research Article

ANANYAŚĀSTRAM:
An International Multidisciplinary Journal
(A Unique Treatise of Knowledge)
Peer-Reviewed | Refereed | Open Access Journal
DOI: https://doi.org/10.64328/aimjv01i02025

Antibacterial Efficacy of Selected Medicated Soaps Against Staphylococcus aureus Isolated from Wound Infections at ABU Medical Center: A Localized Study from Nigeria

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Abstract

This research investigates the antibacterial properties of three commonly used medicated soaps—Crusader, Dettol, and Premier Cool—against clinical isolates of Staphylococcus aureus obtained from wound swab samples. Sixty wound samples were collected from patients attending Ahmadu Bello University Medical Center in Zaria. Standard microbiological methods were employed for the isolation and identification of *S. aureus*. The antibacterial activity of the soaps was assessed through agar well diffusion technique, minimum inhibitory concentration (MIC), and minimum bactericidal concentration (MBC) tests. Soap A (Crusader) exhibited the highest antimicrobial activity against the tested organism with an average of 20mm zone of inhibition followed by soap B (Dettol) at 18mm, soap C (Premier cool) had the least zone of inhibition (16mm). The MIC for soap A, B, and C on the isolates were found to be 1.56%w/v, 6.25%w/v, and 12.5%w/v respectively. The MBC for soap A, B, and C on the isolates were found to be 1.56%w/v, 3.13%w/v, and 12.5%w/v respectively. The results suggest the potential of medicated soaps in infection prevention and highlight the need for public health education and rational product use.

Keywords: Antibacterial efficacy, Medicated soaps, *Staphylococcus aureus,* Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC).

Introduction

Antibacterial activity of any agent is the ability of that agent to inhibit or destroy the proliferation or growth of microorganisms. These effects are referred to as bacteriostatic and bactericidal, respectively. This is important with respect to the human body in preventing sepsis and skin infections (Higaki *et. al., 2000).* Infections and other health related problems have been of great concern to human beings and chemotherapy

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is the main approach in the treatment of such conditions. Investigation into the microbial flora of wound began in the late 19th century and since then; improvements in techniques have facilitated the recovery, identification and enumeration of a wide variety of microbial species. Most wounds support relatively stable polymicrobial communities (Bowkler, *et.al;* 2001) often without signs of clinical infection (Hansson, et al; 1993).

However, potential pathogens may be present and the delicate balance between colonized wound and an infected wound depends on the interplay of complex host and microbial influences (Emmerson, 1998). The development of wound infection has deleterious effect on the patient by causing increased pain, discomfort, inconveniences and can lead to life threatening conditions or even death.

Soaps and other cleansing agents have been in use for several decades and are widely recognized for their role in infection prevention. Although fats and oils are general ingredients of soaps but some additives like, irgasan, trichlorocarbanlide, (TCC) etc., incorporated into them enhance the antibacterial activities of soaps (Friedman and Wolf, 1996).

According to Osborne and Grobe, antibacterial soap can remove 65 to 85% bacteria from human skin (Osborne and Grube, 1982).

Indeed, medicated soaps contains additional ingredients, usually for the treatment of skin disorders. Soap cleanses because molecules of fat are attracted to the fatty part of the anions of soap in water solution and are pulled off by the dirty surface into water (Eckburg *et al.,* 2005).

The present study provides critical insights into the effectiveness of over-the-counter medicated soaps against Staphylococcus aureus, a prevalent pathogen in wound infections. Although numerous international studies have explored the antibacterial activity of soaps, few have assessed brands commonly used in Nigeria and similar low-resource settings. This represents a significant gap in localized antimicrobial surveillance.

In many developing countries, access to sterile medical supplies and advanced wound-care products is limited. As a result, the use of affordable, accessible hygiene products—like medicated soaps—becomes an essential component of community-based infection prevention. This study uniquely contributes to public health by evaluating the actual performance of commercially available soaps within the Nigerian healthcare and domestic context.

By isolating S. aureus from real patient wound swabs and testing locally available soaps under standardized laboratory conditions, the research bridges a critical gap between clinical microbiology and practical community hygiene. The data generated not only informs local healthcare providers and policymakers but also encourages evidence-based product selection for public health interventions.

Ethical Considerations

Ethical approval for this study was obtained from the ABU Medical Center Research Ethics Committee. All procedures followed were in accordance with the ethical standards of the responsible committee and with the

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Helsinki Declaration of 1975, as revised in 2013. Samples were collected anonymously with verbal consent from all participants.

Materials And Methods

Sample collection

The study was conducted using 60 wound swab samples obtained from patients at the Ahmadu Bello University Medical Center, Zaria. Samples were collected aseptically using sterile swabs and transported to the Microbiology Laboratory for immediate analysis.

Screening of the soaps

Three medicated soaps—Crusader (Soap A), Dettol (Soap B), and Premier Cool (Soap C)—were purchased from local pharmacies. Batch numbers and expiry dates were documented. The soaps were prepared in varying concentrations for sensitivity testing.

Chemical Composition of the soaps

To improve reproducibility, the commercial names, batch numbers, and expiry dates of the soaps used were recorded. According to manufacturer information:

Soap A contains Triclocarban (as the active ingredient), sodium palmate, sodium palm kernelate, fragrance, glycerin, titanium dioxide, water.

Soap B contains Chloroxylenol (as the active ingredient), sodium palmate, talc, perfume, disodium EDTA, and glycerin.

Soap C contains Menthol and Triclosan as active agents. Other components include sodium palmate, sodium palm kernelate, perfume, titanium dioxide, and aqua.

Ingredient concentrations were not disclosed by the manufacturers. Future studies are encouraged to conduct chemical analyses of soap formulations to ensure consistency and reproducibility of antimicrobial testing results.

Isolation of target organism

Staphylococcus aureus was isolated on Mannitol Salt Agar and identified via Gram staining, catalase, and coagulase tests. Confirmed isolates (36.7% prevalence) were subjected to antimicrobial susceptibility testing using the agar well diffusion method. Zones of inhibition were measured after 24 hours of incubation at 37°C. MIC and MBC values were determined using standard broth dilution and sub-culturing techniques.

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Determination of Minimum Inhibitory Concentration

Tube Dilution Method

The MIC was determined on those organisms that were sensitive to the medicated soaps. Firstly, Mueller Hinton Broth was prepared according to the manufacturer's specification.

5mls of the prepared Mueller Hinton Broth were pipetted into twenty four test tubes (eight tubes for each medicated soaps i.e. 100%, 50%, 25%, 12.5%, 6.25%, 3.13%, 1.56%w/v and control) using a sterile syringe. These were then autoclaved at 121ºC for 15 minutes. Serial dilutions were made into seven of the tubes using 5ml of each concentrations of the medicated soaps into the tubes. About 0.1ml of the inoculum was inoculated into the labelled tubes and incubated at 37ºC for 24 hours.

A tube containing sterile Mueller Hinton broth without any organism was used as control while the one containing the broth and soap was used as a positive control and turbidity was also observed were turbid solutions show the growth of the organisms. The least concentration without visible growth was taken as minimum inhibitory concentration.

Determination of Minimum Bactericidal Concentration of the Medicated Soaps.

Sterile and fresh plates of Mueller Hinton agar were prepared. All dilutions from the MIC tube to the tube with the highest concentration were sub-cultured on the freshly prepared agar and incubated at 37ºC for 24 hours. The lowest concentration which resulted in no visible growth on the agar plates were marked as the minimum bactericidal concentration of the medicated soaps. Static effects of the medicated soaps were evident by the growth of the organisms and cidal effect by lack of visible growth.

Results

The results for the assessment of antibacterial activity of medicated soaps on *Staphylococcus aureus* isolated from wound are represented on table 1-4.

TABLE 1: Gram reaction and biochemical characterization of the isolate.

Isolates	Morphology (On MSA)	Grams reaction	Catalase	coagulase	Inference
ISNA	Wet raised mucoid Golden yellow colonies	Purple stained Clustered cocci	Bubble formation (positive)	Clump formation (positive)	*S.aureus*
ISNB	Wet raised mucoid Golden yellow colonies	Purple stained Clustered cocci	Bubble formation (positive)	Clump formation (positive)	*S.aureus*
ISNC	Wet raised mucoid Golden yellow colonies	Purple stained Clustered cocci	Bubble formation (positive)	Clump formation (positive)	*S.aureus*

KEY: MSA= Mannitol Salt Agar ISN= Isolates number (A, B, C, etc.)

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TABLE 2: Sensitivity of the three medicated soaps on the isolated S. aureus

N=60, N+=22, P=36.7%

Diameter of zones of inhibition (mm)															
Concentrations	12.5mg/ml			25mg/ml			50mg/ml			100mg/ml			200mg/ml		
Soaps	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Zone (mm)	-	-	-	15	14	12	15	-	12	17	13	8	20	18	15
	12	11	8	13	15	-	13	10	7	17	17	14	20	17	18
	-	12	0	16	13	13	17	14	13	18	13	12	21	-	-
	12	11	9	14	14	11	15	-	12	-	-	-	17	18	15
Average	12	11	9	15	14	12	15	12	11	17	14	11	20	18	16

KEY: - (no clear zone of inhibition),

N (number of sample collected)

N+ (number of positive isolate)

P (prevalence)

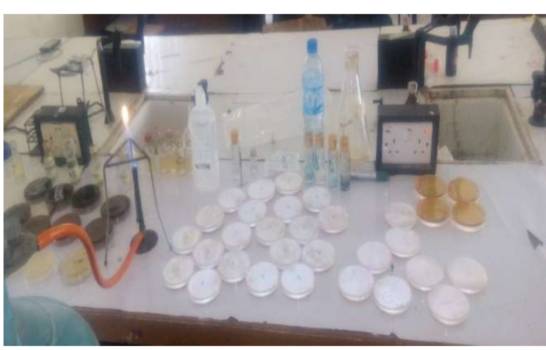
TABLE 3: Minimum inhibitory concentration of the medicated soaps against the isolates

Test Organism	A (%w/v)	B (%w/v)	C (%w/v)
S.aureus			
Concentration	1.56	6.25	12.5

%w/v = weight/volume

TABLE 4: Minimum bactericidal concentration of the medicated soaps

Test Organisms	A (%w/v)	B (%w/v)	C (%w/v)
S.aureus			
Concentration	1.56	3.13	12.5



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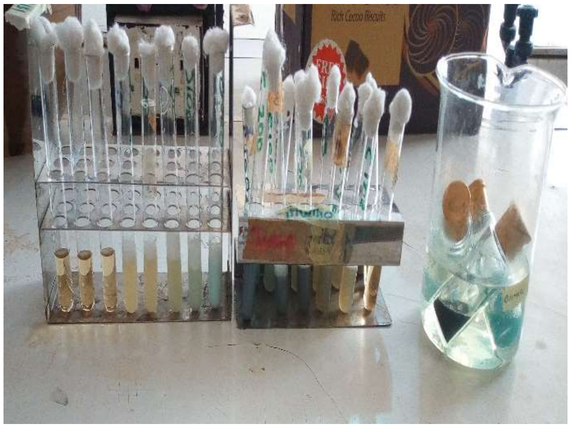

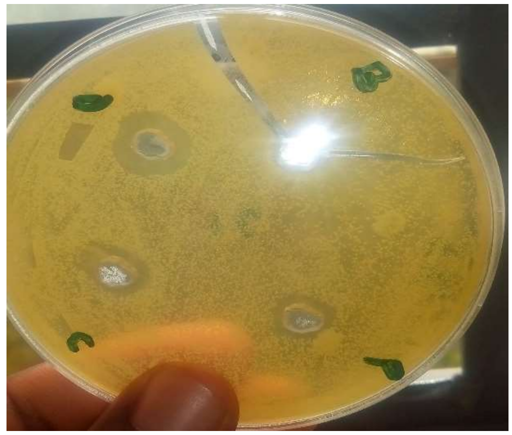

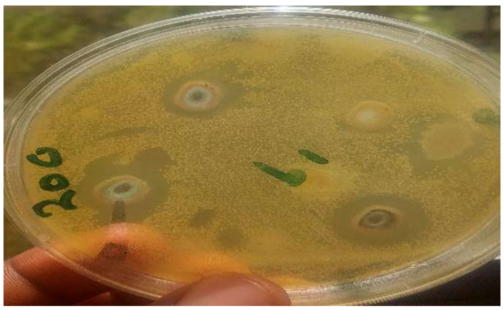

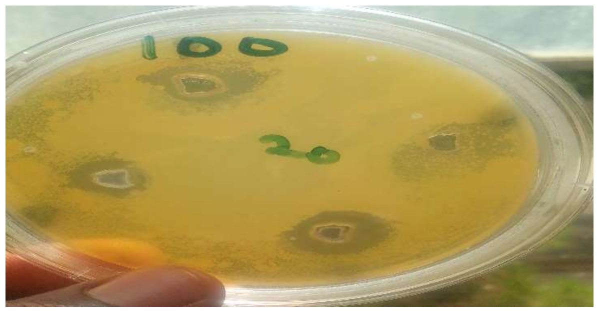

Discussion

The medicated soaps evaluated in this study demonstrated varying degrees of antibacterial activity against Staphylococcus aureus isolates obtained from wound infections. Soap A (Crusader) exhibited the highest level of efficacy, followed by Soap B (Dettol) and Soap C (Premier Cool), as reflected in their respective zones of inhibition, minimum inhibitory concentrations (MIC), and minimum bactericidal concentrations (MBC). These findings suggest that not all medicated soaps are equally effective, and that the presence and concentration of specific antibacterial agents, such as Triclocarban and Chloroxylenol, significantly influence antimicrobial performance.

From a public health standpoint, the implications of these results are far-reaching. First, the demonstrated efficacy of certain soaps, particularly those containing potent antiseptic compounds, highlights their potential role in community-based hygiene education. Many individuals in low-resource environments rely on over-the-counter hygiene products for daily cleanliness and wound care. Ensuring that consumers understand the importance of selecting effective products—and how to use them properly—can empower communities to prevent infections before they occur.

Second, these results support the integration of effective medicated soaps into infection control protocols, especially in settings where access to advanced medical supplies is limited. For instance, in rural clinics and overcrowded healthcare centers, the use of highly effective antiseptic soaps during handwashing and pre-wound cleaning could significantly reduce the transmission of pathogens such as S. aureus, which are known to cause severe complications in post-surgical or open wounds.

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Additionally, this study provides evidence that can be used to inform public health policy and intervention strategies. Health authorities and regulatory agencies may use this data to guide quality control and labelling requirements for hygiene products marketed in developing regions. For example, policies could mandate clearer labeling of active ingredients and their concentrations to allow consumers and healthcare providers to make informed decisions. Furthermore, public procurement programs (e.g., for schools or hospitals) might prioritize antiseptic soaps with proven efficacy.

Overall, the study reinforces the role of basic, cost-effective hygiene products as critical tools in reducing infection risks, promoting public health resilience, and supporting broader antimicrobial resistance mitigation efforts in underserved populations.

Conclusion

This study successfully isolated the target organism (S.aureus) from wound swabs collected from ABU Medical Center and identified using Gram staining, catalase and coagulase tests. The antibacterial activity of the medicated soaps was determined with Soap A having the highest value of inhibition (with an average of 20mm) followed by Soap B (with an average of 18mm) and least in Soap C (with an average of 16mm). The MIC and MBC values of soap A were determine*d* to be 1.56(%w/v) while that of B was determined to be 6.25 (%w/v) and 3.13 (%w/v) respectively and that of soap C to be 12.5 (%w/v).

Recommendation

Regulatory authorities should require manufacturers to disclose chemical compositions to support reproducibility and medicated soaps with proven efficacy should be recommended for wound care and hand hygiene.

Public health campaigns should incorporate guidance on appropriate antiseptic use and further research should explore antibacterial efficacy against multi-drug resistant organisms and in vivo applications.

Additionally, based on the observed effects medicated soaps, it is recommended that excessive or prolonged usage of these products should be discouraged. This is to avoid the issue of resistivity by pathogenic organisms.

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