ANTIMICROBIAL EVALUATION OF JIK DISINFECTANT AND SAFEGUARD MEDICATED SOAP AGAINST SELECTED BACTERIA AND FUNGI

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BEING A PROJECT SUBMITTED TO THE DEPARTMENT OF BIOLOGICAL SCIENCE LABORATORY TECHNOLOGY, AUCHI POLYTECHNIC, AUCHI.

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CERTIFICATION

This is to certify that this project work titled **"**Antimicrobial Evaluation Of Jik Disinfectant Safeguard Medicated Soap Against Selected Bacteria and Fungi**"** was carried out by Obeahon Peculiar Egheosa with Mat No: AST/2382060508 and Obiekee Vivian with Mat No:AST/2382070595 in the school of Applied Science and Technology.

We also certify that the work is adequate in scope and quality in partial fulfillment of the requirements for the award of Higher National Diploma (HND) in Physical Science Laboratory Technology (Microbiology).

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DEDICATION

This work is dedicated to God Almighty for His unending grace and mercies.

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ABSTRACT

A disinfectant is a chemical substance or compound used to inactivate or destroy microorganisms on inert surfaces. This study will evaluate the antimicrobial activityof jik disinfectant and safeguard medicated soap that are against 3 bacterial and 2 fungi. Activities of the soaps were studied against the selected strains of bacteria and fungi to know their antibacterial effect. This study identify antimicrobial activity of jik disinfectant and safeguard medicated soap, to determine the microbial load of isolated bacteria, and to establish public health sensitization and awareness on the antimicrobial properties of jik disinfectant and safeguard medicated soap.This research work would be a immerse benefits to the general public and also contribute to the existing data on the significance of antimicrobial evaluation of jik disinfectant and safeguard medicated soap.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

A disinfectant is a chemical substance or compound used to inactivate or destroy microorganisms on inert surfaces. Disinfection does not necessarily kill all microorganisms, especially resistant bacterial spores; it is less effective than sterilization, which is an extreme physical or chemical process that kills all types of life. Disinfectants are generally distinguished from other antimicrobial agents such as antibiotics, which destroy microorganisms within the body, and antiseptics, which destroy microorganisms on living tissue. Disinfectants are also different from biocides—the latter are intended to destroy all forms of life, not just microorganisms. Disinfectants work by destroying the cell wall of microbes or interfering with their metabolism (Slater, 2020). It is also a form of decontamination, and can be defined as the process whereby physical or chemical methods are used to reduce the amount of pathogenic microorganisms on a surface.

Disinfectants can also be used to destroy microorganisms on the skin and mucous membrane, as in the medical dictionary historically the word simply meant that it destroys microbes. Sanitizers are substances that simultaneously clean and disinfect. Disinfectants kill more germs than sanitizers. Disinfectants are frequently

used in hospitals, dental surgeries, kitchens, and bathrooms to kill infectious organisms *(*Omidbakhsh, 2018). Sanitizers are mild compared to disinfectants and are used majorly to clean things that are in human contact whereas disinfectants are concentrated and are used to clean surfaces like floors and building premises.

Soaps and other cleaning agents are extensively used for a very long time for different cleaning purposes. For generations it has been thought that washing hands with soap and water is a measure of one's personal hygiene. Bacteria found everywhere in soil, water, air, sewage and on human body and hence of great importance with reference to health (Saba R, 2009). Soaps play a very important role both in cleaning and killing bacteria. To enhance their antibacterial activities some active ingredients are added to soap. According to Osborne and Grobe that antibacterial soap can remove about 65-85% of bacterial flora from human skin.

As skin is the first line of defense, so most of the bacteria like Pseudomonas aureginosa and Staphylococcus aureus reside on skin and is the major cause of skin infections. Hand washing with antibacterial is of more importance in accordance with the health care associates as they may be the main cause of bacterial contamination either opportunistic or pathogens (Mwambete, 2011). Soaps contain active ingredients that have an antibacterial activity and also the reducing power against the pyogenic skin infection caused by Staphylococcus

aureus and other gram negative species of bacteria. It is studied that an antibacterial soap is more effective in removing bacteria then a plain soap.

A huge number of chemical compounds are present that have the ability to stop the growth of bacteria and can kill them. These compounds are very large in number possibly 10,000 of which 1000 are being usually used in hospitals and homes. These chemical compounds exist in the form of solids, liquids and gases. Many groups of chemicals used to decrease or destroy microbes. Significant groups include halogens, phenols, soaps, detergents, ammonia compounds, alcohols, heavy metals, acids and certain extraordinary compounds.

A lot of cleaning agents are present in the market, which are presented in various forms with distinct formulation. Triclosan, trichlorocarbanilide and P-chloro-in-xylenol (PCMX/Chloroxylenol) are the commonly used anti-bacterial in medicated soaps (Abbas, 2016). These are generally only contained at preservation level unless the product is clearly marked as antibacterial, antiseptic, or germicidal. Some people consider that the antibacterial portion of soaps is effective against microorganisms and can prevent most communicable diseases, but researchers found that too much use of soaps can be a cause of spreading diseases instead of preventing them. Too much use of medicated soaps might result in a resistant strain, and then the person is more prone to opportunistic skin infections.

1.2 Aim and Objectives of the Study

The aim of this study is to evaluate the antimicrobial activity of jik disinfectant and safeguard medicated soap that are against 3 bacterial and 2 fungi. Activities of the soaps were studied against the selected strains of bacteria and fungi to know their antibacterial effect.

The specific objectives are:

i. To identify antimicrobial activity of jik disinfectant and safeguard medicated soap.
ii. To determine the microbial load of isolated bacteria.
iii. To establish public health sensitization and awareness on the antimicrobial properties of jik disinfectant and safeguard medicated soap.

1.3 Significance of Study

This research work is carried in AuchiThis research work would be a immerse benefits to the general public and also contribute to existing data on the significance of antimicrobial evaluation of jik disinfectant and safeguard medicated soap. It would also serve as a reference and post production process on other to ensure safe product and also to researchers who wish to carry out more investigation in same topic. This study will be of significance importance to students of Science Laboratory Technology as it touches on their area of specialization and also to student from other to other related field.

CHAPTER TWO

LITERATURE REVIEW

2.1 Review of Relevant Literature

Antibacterial soap is a soap which contains chemical ingredients that purportedly assist in killing bacteria. The majority of antibacterial soaps contain triclosan, though other chemical additives are also common. The effectiveness of products branded as being antibacterial has been disputed by some academics as well as the U.S. Food and Drug Administration (FDA).

The earliest antibacterial soap was carbolic soap, which used up to 5% phenols (carbolic acid). Fears about the safety of carbolic soaps chemical components on the skin brought about a ban on some of these chemical components.

Triclosan and other antibacterial agents have long been used in commercial cleaning products for hospitals and other healthcare settings, however they began to be used in home cleaning products during the 1990s (Farzan, 2011). Triclosan and triclocarban are the most common compounds used as antibacterials in soaps. However, other common antibacterial ingredients in soaps include benzalkonium chloride, benzethonium chloride, and chloroxylenol.

Soaps and other cleansing agents have been around for quite long time. Archeological findings during the excavation of ancient Babylon revealed a soap-

like material in clay cylinders. Inscriptions on the cylinders indicate that fats were boiled with ashes, which is a method of making soaps. Likewise, a medical document from about 1500 B.C. shows that Egyptians combined animal and vegetable oils with alkaline salts to form a soap-like material used for treating skin diseases, as well as for washing.

Moses, in the Bible, gave the Israelites detailed laws concerning personal cleanliness. He also related cleanliness to health and religious purification. People were instructed to wash their clothes and bath in water . Nowadays, disinfection, decontamination, antisepsis/sanitization, and sterilization just naming a few, there are terms that describe processes of cleaning by either using soaps/detergents or other cleaning agents. Numerous cleaning agents are available in the market, which are presented in various forms with distinct formulations. Triclosan, trichlorocarbamide and p-chloro-m-xylenol (PCMX/chloroxylenol) are the commonly used antibacterials in medicated soaps (Abbas, 2016). These are generally, only contained at preservative level unless the product is clearly marked as antibacterial, antiseptic, or germicidal.

Scrubbing body or hands, particularly with soaps, is the first line of defense against bacteria and other pathogens that can cause colds, the flu, skin infections and even deadly communicable diseases. Conceptually, many people consider that an antimicrobial potion of soaps is effective at preventing communicable diseases.

But now researchers highlight that too much of it can have the opposite effect-spreading diseases/infections instead of preventing them. Overutilization of medicated soaps might result in antimicrobial resistance and even rendering an individual more vulnerable to microbial attacks such as opportunistic skin infections.

On the other hand, regardless of a wide-spread availability of the so-called medicated soaps; a number of communicable infectious and food-borne diseases as well as poor-hygienic conditions-related health problems are rampant. This can partially be explained by the fact that, occasionally some of these antimicrobial consumer products could have insufficient quantities of antimicrobials. It seems to be more of a marketing phenomenon. Unfortunately, in the long-run may adversely affect the consumers, because overuse of these agents can ascribe to the emergence of drug-resistant microorganisms. This instigated us to embark on evaluation of the antimicrobial effects of the so-called medicated soaps.

2.2 The Effectiveness Antibacterial Soap

Claims that antibacterial soap is effective stem from the long-standing knowledge that triclosan can inhibit the growth of various bacteria, as well as some fungi (Abbas, 2016). However, more recent reviews have suggested that antibacterial soaps are no better than regular soaps at preventing illness or reducing bacteria on the hands of users.

In September 2016, the U.S. Food and Drug Administration banned the use of the common antibacterial ingredients triclosan and triclocarban, and 17 other ingredients frequently used in "antibacterial" soaps and washes, due to insufficient information on the long-term health effects of their use and a lack of evidence on their effectiveness. The FDA stated "There is no data demonstrating that over-the-counter antibacterial soaps are better at preventing illness than washing with plain soap and water". The agency also asserted that despite requests for such information, the FDA did not receive sufficient data from manufacturers on the long-term health effects of these chemicals. This ban does not apply to hand sanitizer. This is due to the fact that hand sanitizer typically utilizes alcohol to kill microbes rather than triclosan or similar ingredients.

A 2017 statement by 200 scientists and medics published in the scientific journal Environmental Health Perspectives warns that anti-bacterial soaps and gels are useless and may cause harm. The statement also cautioned against the use of antimicrobial agents in food contact materials, textiles, and paints. British firm Unilever claimed in 2017 to be phasing triclosan and triclocarban out of their products by the end of the year, adding they would be replaced by “a range of alternatives, including natural and nature-inspired antibacterial ingredients”.

Claims have been made in the media that antibacterial soap is more effective than plain soap in the prevention of the SARS-CoV-2 virus. The CDC and the Food and

Drug Administration both recommend plain soap; there is no evidence that antibacterial soaps are any better, and limited evidence that they might be worse long-term.

2.3 Bacteria

Bacteria are a type of biological cell. They constitute a large domain of prokaryoticmicroorganisms. Typically a few micrometres in length, bacteria have a number of shapes, ranging from spheres to rods and spirals. Bacteria were among the first life forms to appear on Earth, and are present in most of its habitats. Bacteria inhabit soil, water, acidic hot springs, radioactive waste, and the deep portions of Earth's crust. Bacteria also live in symbiotic and parasitic relationships with plants and animals (Abbey, 2008). Most bacteria have not been characterised, and only about 27 percent of the bacterial phyla have species that can be grown in the laboratory (specifically unculturable phyla, known as candidate phyla, make up 103 out of approximately 142 known phyla). The study of bacteria is known as bacteriology, a branch of microbiology.

Virtually all animal life on earth is dependent on bacteria for their survival as only bacteria and some archea possess the genes and enzymes necessary to synthesize vitamin B_{12}, also known as cobalamin, and provide it through the food chain. Vitamin B_{12} is a water-soluble vitamin that is involved in the metabolism of every cell of the human body. It is a cofactor in DNA synthesis, and in both fatty

acid and amino acid metabolism, It is particularly important in the normal functioning of the nervous system via its role in the synthesis of myelin (Allende, 2004).

There are typically 40 million bacterial cells in a gram of soil and a million bacterial cells in a millilitre of fresh water. There are approximately 5×10^{30} bacteria on Earth, forming a biomass which exceeds that of all plants and animals. Bacteria are vital in many stages of the nutrient cycle by recycling nutrients such as the fixation of nitrogen from the atmosphere. The nutrient cycle includes the decomposition of dead bodies; bacteria are responsible for the putrefaction stage in this process. In the biological communities surrounding hydrothermal vents and cold seeps, extremophile bacteria provide the nutrients needed to sustain life by converting dissolved compounds, such as hydrogen sulphide and methane, to energy. Data reported by researchers in October 2012 and published in March 2013 suggested that bacteria thrive in the Mariana Trench, which, with a depth of up to 11 kilometres, is the deepest known part of the oceans. Other researchers reported related studies that microbes thrive inside rocks up to 580 metres below the sea floor under 2.6 kilometres of ocean off the coast of the northwestern United States (Ahvennainen, 2006).

The famous notion that bacterial cells in the human body outnumber human cells by a factor of 10:1 has been debunked. There are approximately 39 trillion

bacterial cells in the human microbiota as personified by a "reference" 70 kg male 170 cm tall, whereas there are 30 trillion human cells in the body (Agrios, 2007). This means that although they do have the upper hand in actual numbers, it is only by 30%, and not 900%.

The largest number exist in the gut flora, and a large number on the skin. The vast majority of the bacteria in the body are rendered harmless by the protective effects of the immune system, though many are beneficial, particularly in the gut flora. However several species of bacteria are pathogenic and cause infectious diseases, including cholera, syphilis, anthrax, leprosy, and bubonic plague. The most common fatal bacterial diseases are respiratory infections, with tuberculosis alone killing about 2 million people per year, mostly in sub-Saharan Africa (Abbey, 2008). In developed countries, antibiotics are used to treat bacterial infections and are also used in farming, making antibiotic resistance a growing problem. In industry, bacteria are important in sewage treatment and the breakdown of oil spills, the production of cheese and yogurt through fermentation, the recovery of gold, palladium, copper and other metals in the mining sector, as well as in biotechnology, and the manufacture of antibiotics and other chemicals (Acevedo, 2001).

Once regarded as plants constituting the class Schizomycetes, bacteria are now classified as prokaryotes. Unlike cells of animals and other eukaryotes,

bacterial cells do not contain a nucleus and rarely harbour membrane-boundorganelles. Although the term bacteria traditionally included all prokaryotes, the scientific classification changed after the discovery in the 1990s that prokaryotes consist of two very different groups of organisms that evolved from an ancient common ancestor. These evolutionary domains are called Bacteria and Archaea(Adams, 2007).

2.4 Structure

Bacteria (singular: bacterium) are classified as prokaryotes, which are single-celled organisms with a simple internal structure that lacks a nucleus, and contains DNA that either floats freely in a twisted, thread-like mass called the nucleoid, or in separate, circular pieces called plasmids. Ribosomes are the spherical units in the bacterial cell where proteins are assembled from individual amino acids using the information encoded in ribosomal RNA (Allende, 2004).

Bacterial cells are generally surrounded by two protective coverings: an outer cell wall and an inner cell membrane. Certain bacteria, like the mycoplasmas, do not have a cell wall at all. Some bacteria may even have a third, outermost protective layer called the capsule (Ahvennainen, 2006). Whip-like extensions often cover the surfaces of bacteria long ones called flagella or short ones called pili that help bacteria to move around and attach to a host.

2.5 Classification

A few different criteria are used to classify bacteria. The organisms can be distinguished by the nature of their cell walls, by their shape, or by differences in their genetic makeup.The Gram stain is a test used to identify bacteria by the composition of their cell walls, named for Hans Christian Gram, who developed the technique in 1884. The test stains Gram-positive bacteria, or bacteria that do not have an outer membrane. Gram-negative bacteria don't pick up the stain(Adams, 2007). For example, *Streptococcus pneumoniae* (*S. pneumoniae*), which causes pneumonia, is a Gram-positive bacterium, but *Escherichia coli* (*E. coli*) and *Vibrio cholerae*, which causes cholera, are Gram-negative bacteria.

There are three basic bacterial shapes: Round bacteria called cocci (singular: coccus), cylindrical, capsule-shaped ones known as bacilli (singular: bacillus); and spiral bacteria, aptly called spirilla (singular: spirillum). The shapes and configurations of bacteria are often reflected in their names(Adams, 2007). For example, the milk-curdling*Lactobacillus acidophilus* are bacilli, and pneumonia-causing *S. pneumoniae* are a chain of cocci. Some bacteria take other shapes, such as stalked, square or star.

2.6 Reproduction

Most bacteria multiply by a process called binary fission, according to the Cornell University College of Agriculture and Life Sciences. In this process, a

single bacterial cell, called the "parent," makes a copy of its DNA and grows larger by doubling its cellular content. The cell then splits apart, pushing the duplicated material out and creating two identical "daughter" cells(Agrios, 2007).

Some bacterial species, such as cyanobacteria and firmicutes, reproduce via budding. In this case, the daughter cell grows as an offshoot of the parent. It starts off as a small nub, grows until it is the same size as its parent, and splits off (Allende, 2004).The DNA found in parents and offspring after binary fission or budding is exactly the same. Therefore, bacterial cells introduce variation into their genetic material by integrating additional DNA, often from their surroundings, into their genome. This is known as horizontal gene transfer; the resulting genetic variation ensures that bacteria can adapt and survive as their environment changes. [Watch Strange, Glowing Bacteria Harpoon and Swallow DNA to Evolve]There are three ways horizontal gene transfer occurs: transformation, transduction and conjugation.

Transformation is the most common process of horizontal gene transfer and occurs when short DNA fragments are exchanged between donors and recipients. Transduction, which typically only occurs between closely related bacteria, requires the donor and recipient to transfer DNA by sharing cell surface receptors. Conjugation requires physical contact between the cell walls of bacteria; the DNA

transfers from the donor cell to the recipient. Through conjugation, a bacterial cell can transfer DNA to eukaryotic cells (multi-celled organisms). Conjugation aids in the spread of antibiotic-resistance genes (Ahvennainen, 2006).

2.7 Bacteria in Human Health and Disease

Bacteria can be beneficial as well as detrimental to human health. Commensal, or "friendly" bacteria, share space and resources within our bodies and tend to be helpful. There are about 10 times more microbial cells than human cells in our bodies; the highest numbers of microbial species are found in the gut, according to microbiologist David A. Relman's 2012 article in Nature (Ahvennainen, 2006).

The human gut is a comfortable setting for bacteria, with plenty of nutrients available for their sustenance. In a 2014 review article published in the American Journal of Gastroenterology, the authors mention that gut bacteria and other microorganisms, such as helpful strains of *E.coli* and *Streptococcus*, aid in digestion, stave off colonization by harmful pathogens, and help to develop the immune system. Moreover, the disruption of gut bacteria has been linked to certain disease conditions(Agrios, 2007). For instance, patients with Crohn's disease have an increased immune response against gut bacteria, according to a 2003 review published in the journal The Lancet.

Other bacteria can cause infections. Several bacteria — ranging from so-called group A *Streptococcus*, *Clostridium perfringens* (*C. perfringens*), *E. coli* and *S. aureus* can cause a rare but severe soft tissue infection called necrotizing fasciitis (sometimes called flesh-eating bacteria). According to the Centers for Disease Control and Prevention (CDC), this infection affects the tissues surrounding muscles, nerves, fat and blood vessels; it can be treated, especially when caught early(Agrios, 2007).

2.8 Antibiotic Resistance

Antibiotics are typically used to treat bacterial infections. However, in recent years, improper and unnecessary use of antibiotics has promoted the spread of several strains of antibiotic-resistant bacteria (Ahvennainen, 2006).In cases of antibiotic resistance, the infectious bacteria are no longer susceptible to previously effective antibiotics. According to the CDC, at least 2 million people in the U.S. are infected with antibiotic-resistant bacteria every year, leading to the death of at least 23,000 people.

"Pretty much any infection you can think of now has been identified as being associated with some level of resistance," said Dr. Christopher Crnich, an infectious disease physician and hospital epidemiologist at the University of Wisconsin Hospitals and Madison Veterans Affairs Hospital. "There's very few

infections that we now treat where infections caused by resistant bacteria is not a clinical concern."

MRSA, for example, is one of the more notorious antibiotic-resistant bacterial strains; it resists methicillin and other antibiotics used to treat *Staphylococcus* infections, which are acquired primarily through skin contact (Ahvennainen, 2006). MRSA infections occur in health-care settings such as hospitals and nursing homes, where it can lead to pneumonia or bloodstream infections. MRSA also spreads in the community, especially in situations where there is a lot of exposed skin, other physical contact, and the use of shared equipment for example, among athletes, in tattoo parlors, and in day care facilities and schools. Community-acquired MRSA most often causes serious skin infections.An important facet of combating antibiotic resistance is to be careful about their use. "It's so important for us to use antibiotics intelligently," Crnich told LiveScience. "You only want to use an antibiotic when you have a clear-cut bacterial infection."

CHAPTER THREE

MATERIALS AND METHODS

3.1 Materials Used

Jik disinfectant, Safeguard medicated soap,Nutrient agar, Measuring cylinder, Petri dishes, Beaker, Pipette, Flat bottom flask, Weighing balance, Test tube rack, Autoclave, Incubator, Slide, Microscope, Cotton wool, Test tubes, Distilled water, Spatula, Wire loop, Forcep, Hand gloves, Rotary extractor, Containers with lids, Bijou bottles, Test organisms (*E. coli, Candida albican Streptococcus sp*. and *Klebsiella sp*.) Syringes, Cork borer, Metre rule Masking tape, Aluminum foil, Methylated spirit, Filter paper, Ethanol and Bunsen burner.

3.2 Study Area

The study area was Auchi metropolis, Edo State, South-South region of Nigeria. Auchi is a well-populated area which houses Auchi Polytechnic and most residence within the Local Government Area visit Auchi for their local needs.

3.3 Sterilization of Materials

All glass wares were first washed with detergent and rinsed with distilled water, wrapped with aluminum foil after drying and sterilized by dry heat method in the oven at a temperature of 160^{o}c for 2-3hrs.

3.4 Disinfection of Working Area

The working area were disinfected thoroughly before and after use with ethanol (75% v.) cotton wool was soaked in ethanol and used to clean the working bench; a Bunsen burner was put on and the flame was allowed to burn, this helped in sterilizing the air in the laboratory.

3.5 Sample Collection

Samples of Jik disinfectant and Safeguard medicated soap samples were purchased from major markets within Auchi. Samples were collected in triplicates and were aseptically collected in a clean nylon and immediately taken to the Microbiology Laboratory of Auchi Polytechnic, Auchi for further microbiological analysis as described by the methods of Fawole and Oso (2001).

3.6 Culture Media

The media used in this study is Nutrient Agar; the media was prepared according to manufacturer's specification.

3.6.1 Preparation of Nutrient Agar

28g of nutrient agar powder was weighed using a weighing balance and dispensed into a beaker; 1000mls of distilled water was measured using a measuring cylinder and dispensed into the beaker containing the agar powder; it

was stirred to dissolve for 10mins. The mixture was transferred into a conical flask and the neck of the flask was corked with cotton wool wrapped in aluminum foil. It was autoclaved at a temperature of 121^{o}c and pressure of 15psi for 15-20minutes.the sterilized agar was allowed to cool to about 45^{o}c and then aseptically poured into Petri dishes and allowed to set (Cheesbrough, 2006).

3.7 preparation of sample concentration

Five concentrations of the Jik disinfectant and Safeguard medicated soap were used for the antimicrobial studies which are 100%, 80%, 60% 40% and 20%. The concentration was reduced by measuring the pure material as 100% concentration. For 80% concentration; 8mls of the pure extract was measured and dissolved with 2mls of distilled water. For 60% concentration, 6mls of the pure extract was measured and dissolved with 4mls of distilled water; the trend was followed until 20% concentration was obtained.

3.8 Source of Test Organisms

Slants of clinically identified microorganisms that had already been characterized were collected from the Microbiology Laboratory of Auchi Polytechnic Cottage Hospital and taken to the Microbiology Laboratory of the Department of Biological Science Laboratory Technology; Auchi Polytechnic Auchi where they were treated with different concentration of Jik disinfectant and

Safeguard medicated soap extracted using different solvents. The identified organisms were: *E. coli, Candida albican Streptococcus sp*. and *Klebsiella sp*..

3.10 Antibacterial Sensitivity Test

A total of 22 plates was used based on the concentration and organisms so each concentration for each organism and a control.

The molten agar were poured into sterile petri-dishes and allowed to solidify after which the test organisms were streaked on the petri-dishes.

Agar wells (holes) were bored on the streaked plates, and then the different concentration of the extracts were poured into the wells and incubated at 37^{o}c for 24hrs after which the zone of inhibition were measured and results recorded.

4.2 Discussion

Usually, consumers buy and utilize antimicrobial products to stay healthy, with an intention to protect themselves from potentially harmful organisms. However, they often fail to consider the inherent risks in both, the chemical exposure that they voluntarily subject themselves to and the potential increase in antibiotic-resistant pathogens in the environment. Regular soaps and water have worked for centuries and there is no scientific evidence that this combination has lost its efficacy. Moreover, alcohol based hand rubs have extensively been used in the hospital environment as an alternative to antimicrobial/antiseptic soaps, which provide a better skin tolerance as compared to antiseptic soap due to the moisturizing and softening agents in the formulation. Hand rubs have also demonstrated to have more effective microbiological properties as compared to antiseptic soaps.

The Jik disinfectant and Safeguard medicated soap are dose-dependent inhibition of the microorganisms. The highest concentration of 100% extracts had

the highest inhibition as the concentration was reduced, the zone of inhibition also reduces, and this result is in line with the report of Chuku *et al.*, (2016).

In the present study presented in table 4.1, the Jik disinfectantshowed more antibacterial activity of 3.0mm, 2.0mm, 4.0 and 4.0mm at 100% concentration against *E. coli, Candida albican Streptococcus sp*. and *Klebsiella sp*. respectively compared to the Safeguard medicated soap,which at 100% concentration had a zone of inhibition of 2.0mm, 1.0mm, 2.0mm, and 2.0mm for *E. coli, Candida albican Streptococcus sp*. and *Klebsiella sp*. respectively. The study revealed that as the concentration of the extract was reduced, the activity against the test organisms also reduced.

The minimum inhibition concentration (MIC) of the water extract against *E. coli* was 80% concentration, and 60% concentration for all other water extracts against the entire test organism.The most susceptible was *E. coli, Candida albican* and *Streptococcus sp.* with an MIC of 60% (1.0mm, 1.0 and 1.0mm concentration for the Jik disinfectant against these organisms respectively.

Although bacterial susceptibility to antibiotics is fairly well characterized, currently the relevance of a change in the minimum inhibitory concentrations of antiseptics or disinfectants is unknown. Therefore, failure of bactericides to kill clinically isolated bacteria can be associated with alterations of their antibiotic

susceptibility profiles. Overuse of chemicals like triclosan has been suggested to cause sensitive bacteria to evolve resistance to its antibacterial actions.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The activity of the Jik disinfectant and Safeguard medicated soapon the tested respiratory infection causing pathogenic bacteria confirms the traditional use of the plant for curing respiratory tract infections, and thus meets with the objective of this research in its effort to uncover at least a single compound whose a chemotherapeutic index equal or exceed the drugs used to cure pneumonia and other respiratory infections.Jik disinfectant and Safeguard medicated soap extract had also proved to be active against *Candida albican* thus can be used in the treatment of diseases related to candidiasis and virginal diseases.

5.2 Recommendation

Based on the result of this research, further work should be done to purify and characterize these bioactive substances in Jik disinfectant and Safeguard medicated soap toidentify the main active ingredient in a bid to transform this into a drug and the dose be known.

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