Antibiotic Susceptibility of Bacteria Isolated From Under Nails

Zahraa AL-Taee[1], Sura Ihsan Abed Jabuk[1], Raflaa S.H. Hussian[1], Zainab H. Kareem[2], Yasir H. AL-Mawlah[1]

[1]Lecturure Dr., [2]Assistant Lecturer, University of Babylon, College of Science, Department of Biology, Hilla, Iraq

Abstract

This study was designed for isolation and diagnosis of bacteria from under long dinger nails of a wide population of student (kindergarten, primary schools, elementary schools and university students) and study the antibiotic sensitivity for isolated bacteria.

From 100 sample the bacterial isolate were *Staphylococcus* sp.(56 isolate), *Bacillus* sp.(1 isolate), *Streptococcus* sp. (1 isolate), *Escherichia coli* (40 isolate), *Salmonella* (2 isolate), *Enterobacter*(10 isolate), *Klebsiella* (10 isolate), *Serratia* (5 isolate) and *Pseudomonad* (6 isolate).

The most effected antibiotic on all types of bacteria isolated from under the long nail was Gatifloxacin and the lowest effect was Cefazolin antibiotic.

The concept of the study was isolating and determining bacteria, found under the long fingernails and studying their antibiotic sensitivity.

Keywords: *Under Nails; Antibiotic; Bacteria Isolated ; Health.*

Introduction

The skin on the human body is in permanent contact with the environmental microorganisms, these contaminant microorganisms can easily be isolated in laboratories. These microbes can induce a range of diseases in the community or hospital, including urinary tract, respiratory tract, injuries and burns, bacteremia, neonatal meningoencephalitis, empyema and osteomyelitis. The hand acts as a significant transmission platform for different microbes, including the enteric species [1].

The most in touch human body components with the outside world are the hands. People are using their hands every day for a wide range of different activities. Contacting distinct microbes and transferring them to other objects and perhaps even individuals is highly simple. Surprisingly, the larger number of bacteria discovered on human hands are under fingernails [2]. In many health-related problems, fingernails are progressively seen as a significant concern due to the ability to harbor many kinds of microorganisms [3].

The finger nail is a significant structure consisting of the protein, keratin, laminated layers. Nails have two key roles, in spite their tiny number. They function as a protective lamina and by acting as a counter-force to improve the feeling of the fingertip. Every nail comprises several components including: nail root, nail bed, nail plate, perionychium and hyponychium [4].

Even microbes may still occur under fingernails when hands are washed. Higher microorganism populations (2 to 3 log CFU / fingernail) 10 happen commonly under the nails and are often more hard to remove than at other hand places (CDC, 2002). Length and texture of the fingernails also influence the effectiveness of microbial removal from below the nails. Long and polished nails usually contain more microbes after cleaning hands than brief and unpolished nails [5].

Therefore, using artificial fingernails can be a factor that influences the effectiveness of hand washing as artificial nails are generally longer than natural nails. Several studies have shown that greater populations of microbial are retrieved from artificial nails than natural nails [3]. Effective hand washing techniques are crucial in stopping disease transmission via finger nails to remove microbes from artificial or natural [6].

The higher population of pathogenic microorganisms found under long nails were *Escherichia coli, Shigella, Salmonella, Enterobacter, Klebsiella, Serratia , Proteus ,Bacillus and pseudomonas* [6, 7].

Materials and Method

Collection of samples

A total of 100 samples were collected from Kindergarten students, primary, secondary and university students. This study was conducted between October 2017 and May 2018 in Al-Hillah city. The samples were gathering by sterile tooth picking, the tooth picking was scrub throughout the surface of the under-nails and moved to the brain heart infusion broth to guarantee that bacteria remained alive, after the broth was incubated at 37°c for 18 h.

Methods of isolation and diagnosis

Culturing Methods

In the research, the nutrient agar medium was used for bacterial culturing. Detailed data was gathered under the samples of the nails (lengthy nails) depending on era and sex. The crops were incubated at 37 ° C and bacterial development was inspected at 24 hours. To achieve pure culture, separate colonies were sub-cultured into nutrient agar. Shape and color of colonies (morphological characteristics) , gram stain tests and biochemical tests were used to identify bacteria.

Identification of Bacteria

Bacteria were diagnosed by using several selective media like, mannitol salt agar, maCconky agar, eosin methylene blue, SS agar and blood agar also bacteria were gram stained.

Antibiotic Susceptibility Test

Several antibiotic dicks were used (Aztreonam ATM(30mcg) ,Cefazolin CZ(30mcg), Cefotaxime CTX(30mcg), Clindamycin DA(2mcg), colistin CT(10mcg), Gatifloxacin GAT (5mcg), Nitrofuranton F(300mcg) and Trimethoprim/ Sulphamethoxazol SXT(25mcg)) to test the sensitivity of bacteria .The test was done by using Muller Hinton media.

Result and Discussion

Microorganisms existence under the nails has become the most widely health issue. A total of 100 samples from under nails by tooth picks were gathered from under the nails, 100 students were gathered in the left and right hands.

All students (100%) found that they were harboring bacteria under their nails. Bacterial pathogens that were isolated from the students ‘ lower nails were found in (table 1).

Table (1): Types and Number of bacteria isolated from samples under nails

No.	Gram – positive		Gram – negative	
1.	Staphylococcus sp.	56	Escherichia coli	40
2.	Bacillus sp.	1	Salmonella	2
3.	Streptococcus sp.	1	Enterobacter	10
4.			Klebsiella	10
5.			Serratia	5
6.			Pseudomonad	6
7.	Total	58	Total	73

Rayan and Flournoy Clarify the presence of large bacterial growth under fingernails over 1 mm in length, showing that volunteers with short finger nails (cut correctly) had 64% bacterial contamination (bacterial count) and volunteers with lengthy finger nails had more (67%) bacterial count presence on their hands [8].

Lin indicated that more microorganisms tend to harbor lengthy fingernails than brief nails. Visibly smooth nails were only noted by the appearance of students ‘ finger nails, showing 62% bacterial contamination on their hands. Ray noted there was a reduction in the bacterial isolates after washing hands with soap [9, 10].

Tambekar also found the largest bacterial contamination (70%) in the hands of Kindergarten volunteers followed by 67% in the hands of primary volunteers, 66% in the hands of secondary pupils, 64% in the hands of PG volunteers and at least (57%) in the hands of undergraduate volunteers [11].

The Microorganisms that isolated and diagnosed from fingernail tested for antibiotic sensitivity, eight antibiotic were used as mentioned in material and methods, (antibiotic resistance pattern were shown in table (2).

Table (2) antibiotic resistance pattern of isolated bacterial species from finger nail (compared with NCCLS guidelines)

No.	Bacterial strains	Clear zone diameter (mm)							
		CZ	F	CT	GAT	ATM	DA	CTX	SXT
1.	Pseudomonad	R	R	R	S	R	R	R	R
2.	Klebsiella	R	R	R	R	R	R	R	R
3.	Streptococcus sp.	R	R	R	S	R	R	S	R
4.	Escherichia coli	R	R	R	R	R	R	R	R
5.	Salmonella	R	R	S	S	S	R	R	R
6.	Staphylococcus sp.	R	S	R	S	R	S	R	R

Diagram (1) Clear zone diameter by (mm) for different strain and antibiotic types

As it is clear from the diagram above Gatifloxacin was the most effected antibiotic on the bacteria isolated from under nails and the lowest effect was belong to Cefazolin .

Kibret M. Says *E.Coli* isolates show high erythromycin, amoxicillin and tetracycline resistance levels. For experimental treatment of *E. coli*, nitrofurantoin, norflaxocin, gentamicin and ciprofloxacin are regarded suitable *E. coli* in the field of research. It is recommended to monitor regularly antimicrobial susceptibility [12] while the result of this study , *E.coli* show resistant to all antibiotics that had been studied.

The results of *Salmonella* sensitivity test show high level of resistance to cefazolin, nitrofuranton, clindamycin, cefotaxime and trimethoprim/ sulphamethoxazol and had mild sensitivity to colistin, gatifloxacin and aztreonam; Mijovic etal noticed that there were increase in the susceptibility rate to many antibiotic between their two surveys [13].

The sensitivity was tested in vitro and on the basis of laboratory results, antibiotics were given to patients. Over the past 21 years, *Klebsiella* has shown a substantial shift in sensitivity pattern. These organisms ‘ sensitivity to different antibiotics tested has decreased over time. The organism carries out most of the in vitro antibiotics it is subjected to. Srinivasan and his coworkers explained their efforts should be focused on reducing the use of antibiotics or a correct antibiotic policy that controls the meaningless and excessive use of antibiotics [14]. their fears about gaining bacteria multi-resistance drugs traits had been observed in this research as the *Klebsiella* isolate was resistant to all eight antibiotics used.

Pseudomonas antibiotic susceptibility test appear that *Pseudomonas* strains were resistance to almost all antibiotics and sensitive only to gatifloxacin ,as clear from this study *Pseudomonas* resistant to colistin while Sader and his coworkers maintained that *Pseudomonas* show sensitivity >90% to colistin in the time between 2012-2015 [15].

Streptococcus isolate that obtained from this study was resistant to Aztreonam ,Cefazolin, Clindamycin, colistin, Nitrofuranton and Trimethoprim/ Sulphamethoxazol , while it was sensitive to Cefotaxime , Gatifloxacin , The highest resistance *Streptococcus* showed to erythromycin, clindamycin and trimethoprim-sulfamethoxazole and these should be avoided in the treatment [16].

Staphylococcus colonies showed resistance to most antibiotic that had been used in the study as listed in table (2), *Staphylococcus* spp. Also show sensitivity to three types of antibiotics (Nitrofuranton, Gatifloxacin and Clindamycin), many researchers reported that *Staphylococcus* which isolated from finger nail have multiple antibiotic resistant [6, 17, 18].

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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