

Study to Assess Antimicrobial Susceptibility of *Staphylococcus* sp. from Mobile phone users in Hospital Population

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*Mobile phones may act as a reservoir of pathogen which in turn may cause significant loss in the form of morbidity and mortality. The distribution pattern of pathogens varies with sampling site and also depends on mode of transmission. The organisms isolated from cell phones causes many infections. But some organisms developed resistance against some antibiotics. The total of 472 swab samples of mobile phone from hospital personnel were collected and studied for the presence of pathogens. Bacterial growth was obtained from 98.7% (466/472) of the mobile phones from hospital population. **Staphylococcus** sp. showed maximum growth 63.7% (297/466), **Staphylococcus** sp. was observed resistant to six antibiotics out of twelve antibiotics that we check, while it was sensitive to ciprofloxacin and ofloxacin (96.2%), roxithromycin, tetracycline and pefloxacin (93.6%) and gentamicine (54.8%).*

Keywords: *Staphylococcus* sp., Antibiotic sensitivity of *Staphylococcus*.

1. INTRODUCTION

Mobile phones are the important devices of day to day life. But these are also the carriers of various organisms. Since these are used by one and all, hence these serve as the means of transportation of pathogens from one individual to others. In the hospital scenario, where the population of microbes is already more in atmosphere, the cell phones can become important source of spread of microbes [1]. In hospital environment, the rate of acquired infection is more in comparison to any other environmental settings [2]. A study was conducted on the use of mobiles and the transmission of pathogens in hospital staff in New York and Israel. The instruments, not properly disinfected, serve as source of infection in hospitals [3].

One study came to the result that pathogenic bacteria are present on approximately 40% of mobile phones belonging to patients in a hospital, and on approximately 20% of mobile phones belonging to the hospital staff [4]. Mobile phone could be a health hazard with tens of thousands of microbes living on each square inch of the phone. *Staphylococci*, particularly *S. epidermidis* are members of the normal flora of the human skin, respiratory and gastrointestinal tract [5]. Nasal carriage of *S. aureus* occurs in 20-50% of human beings.

2. MATERIALS AND METHODS

2.1. Sampling Procedure

Samples were collected from two populations- Health care workers (HCWs) and non Health Care Workers (non- HCWs). A total no. of 472 mobile phones samples from Health Care Workers (HCWs) including doctors (100), nurses (149), lab staff (74), ward boys (75) and non Health Care Workers (non-HCWs), patient's attendant (74) were collected from various hospitals.

2.2. Isolation

A sterile cotton swab moistened with sterile normal saline was rolled over the exposed surfaces of the mobile phones which were frequently used. Care was taken to make sure that the keypad and all buttons were swabbed properly since these areas are most frequently in contact with the tips of fingers and hands. After collection, these samples were transported within 30 minutes, were streaked onto nutrient agar media and soybean casein agar media and incubated overnight at 37°C. After an overnight incubation, visible colony appears on nutrient agar and soybean casein agar plates. These isolated colonies were sub cultured on different media like 5% Sheep blood agar and others for isolation in pure form.

2.3. Identification of Isolates

Identification of isolated bacteria was done with the help of morphological, cultural and biochemical characterization.

2.4. Antibiotic Sensitivity Test

Antibiotic sensitivity was done using Kirby-Baur disc diffusion method on Mueller – Hinton agar. The diameter of zone of clearance was measured to the nearest whole millimeter and interpreted on the basis of CLSI 2005.

3. RESULTS AND DISCUSSION

In our study bacterial growth obtained from total mobile phone samples was 98.7% (467/472). Similarly, a study on “cell phone as reservoir of pathogen” was carried out in Coimbatore. A total of 84 cell phones belonging to doctors at the PS Govinda Swamy Naidu (PSG) hospitals and about 60 cell phones belonging to doctors working in the pre and para-clinical departments of PSG Institute of Medical Sciences and Research, Coimbatore, were screened for bacterial isolates. Except for the 12 new cell phones, all the others (91.6%) were found to be contaminated 76 (90.4%) owned by clinical doctors and 56 (93.3%) owned by non clinical doctors [6]. The bacterial contamination rate of 94.5% among the hospital staff mobile phone was reported [7]. The Characterization of the *Staphylococcus* sp. was done using colony morphology, microscopy and different biochemical tests, they are Gram's positive, non motile, non-spore forming, cocci in grape like clusters, aerobic and facultative anaerobes, on blood agar β type haemolysis, golden colour colonies appear, indole and oxidase negative, coagulase, citrate, urease

and catalase positive, fermentation of sugars, glucose, sucrose, lactose and manitol positive showing in Table1.

Table 1: Characterization of the *Staphylococcus* sp. using colony morphology, microscopy and different biochemical tests.

S. No.	Parameters	Characterization
1.	Cultural Characteristic on Blood agar	
	Aerobic / Anaerobic	Aerobic and facultative anaerobes
	Temperature	35°C ±2
	Size of colony	Large colony (1-3 mm)
	Form	Circular
	Colony consistency	Butyrous
	Elevation	Low convex
	Margin	Entire
	Surface	Smooth
	Colour	Golden colour
	Haemolysis	β type on blood agar
	Opacity	Densely Opaque
	2.	Microscopic examination
Gram's staining		Gram's Positive
Motility		Non motile
Spore		Non-spore forming
Shape		Cocci in grape like clusters
3.	Biochemical characterization	
	Indole	Negative
	Coagulase	Positive
	Methyl red reaction	Positive
	Voges-Proskauer	Positive
	Citrate	Positive
	Urease	Positive
	Catalase	Positive
	Oxidase	Negative
	Gelatin liquification	Positive
	Acid production	Positive
	Gas production	Negative
4.	Fermentation of sugars	
	Glucose	Positive
	Manitol Fermentation	Positive
	Sucrose	Positive
	Lactose	Positive

We found quantification of the growth of *Staphylococcus* sp. isolated from the total mobile phone samples was 63.7% (297/466) showing in Table 2, from hospital population, that was further, differentiated into HCWs (n=393) and non- HCWs (n=74). The differential prevalence of microbial growth *Staphylococcus* sp. from mobile phones of HCWs was 63.6% (250/393) and non-health care workers was 64.3% (47/73) showing in Table 2.

Thus we see that growth of *Staphylococcus* sp. is quite heavy. In a study in three teaching hospitals in Kerman, Iran reported 32% of mobile phones and 39.3% of dominant hands having bacterial contamination and *Staphylococcus epidermidis* was the most commonly cultured organisms from all sites [8]. The potential disease-causing agents, for example, *S. aureus* could elaborate toxins in foods, which are dangerous to human and other animal health [9]. Thus, it has been known to be responsible for food intoxication and poisoning [10]. Other organisms isolated include *Micrococcus* sp. which causes micrococcal infections associated with that of *Staphylococcus* sp. eg. abscess, which generally produces an ulcerative condition of the mouth and throat and may later be localized in some internal organs and produce infections [11].

Table 2: Quantification of the growth of *Staphylococcus* sp. isolated from mobile phone samples.

S. No.	Analysis Parameter	For Total Mobile Phones	For Mobile Phones of HCWs	For Mobile Phones of Non-HCWs
1.	Total no. of Mobile Phones	472	398	74
2.	Mobile Phones showing no bacterial growth	06	05	01
3.	Mobile Phones showing bacterial growth	466	393	73
4.	Number and Percentage of Mobile Phones having <i>Staphylococcus</i> sp.	297 63.7%	250 63.6%	47 64.3%

Twelve different antibiotics were used against isolated *Staphylococcus* sp. identified from HCWs and non-HCWs mobile phone samples. The sensitivity of isolated bacterial sp. to antibiotics was determined on Muller-Hinton agar by the disk diffusion method [12]. The diameter of zone of clearance measured to the nearest whole millimeter and interpreted on the basis of CLSI [13]. In our study the *Staphylococcus* sp. was observed resistant to six antibiotics out of twelve antibiotics that we check, while it was sensitive to ciprofloxacin and ofloxacin (96.2%), roxithromycin, tetracycline and pefloxacin (93.6%) and gentamicine (54.8%) showing in Table 3. In other study *Staphylococcus aureus* were found to be resistant to drugs like ampicillin, chloramphenicol, cephalosporin followed by tetracycline, ofloxacin, norfloxacin and amikacin.

Table 3: Antibiotic sensitivity testing of *Staphylococcus* sp. isolated from mobile phone samples by Kirby-Bauer method (1966).

Name of Antibiotic discs used	Code	Strength of disc	% of sensitivity	Zone of inhibition around the discs in mm	Indication of sensitivity	Degree of sensitivity
Ampicillin/ Sulbactam	AS	20 mcg.	-	-	-	Resistant
Co-Trimoxazole	BA	25 mcg.	-	-	-	Resistant
Cephalexin	PR	30 mcg.	-	-	-	Resistant
Tetracycline	TE	30 mcg.	93.6	20	++++	Highly sensitive
Cefotaxime	CF	30 mcg.	-	-	-	Resistant
Ciprofloxacin	CP	5 mcg.	96.2	22	++++	Highly sensitive
Pefloxacin	PF	5 mcg.	93.6	21	++++	Highly sensitive
Ofloxacin	OF	5 mcg.	96.2	22	++++	Highly sensitive
Cloxacillin	CX	5 mcg.	-	-	-	Resistant
Roxithromycin	RF	15 mcg.	93.6	20	++++	Highly sensitive
Lincomycin	LM	2 mcg.	-	-	-	Resistant
Gentamicin	GM	10 mcg.	54.8	12	++	Moderately sensitive

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