Prevalence and Antibiotic Sensitivity of *Enterococcus* sp. from Mobile Phones of Doctors and Nurses

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Mobile phone may facilitate frequent transmission of bacterial isolates from one person to another. The telephone and computer accessories are well known objects for the spread of infectious agents to healthy or immunocompromised individuals not only in hospitals but also in community. The total of 472 swab samples of mobile phone from hospital personnel were collected and studied for the presence of pathogens. The total bacterial growth obtained from mobile samples was 98.7% (466/472), from hospital population, whereas **Enterococcus** *sp. prevalence was 13.9% (65/466), the growth of* **Enterococcus** *sp. isolated from mobile phones of doctors was 14.2% (14/98) and from nurses mobile phones it was 11.4% (17/149) whereas from health care workers it was 13.4% (53/393) and non health care it was 16.4% (12/73). The antibiotic sensitivity of* **Enterococcus** *sp. was found resistant all antibiotics except cloxacillin (100%), co-trimoxazole (55.3%) and gentamicin (52.3%).*

Keywords: *Enterococcus* sp. *antibiotic sensitivity*, nosocomial infection and mobile phones.

1. INTRODUCTION

Bacterial contamination of communication devices could be an important issue affecting the implementation of effective infection control measures and might have an impact on efforts to reduce cross-contamination. These communication devices may be computer and mobile phone.

Telephone and computer accessories are well known objects for the spread of infectious agents to healthy or immunocompromised individuals not only in hospitals but also in community [1]. The use of cell phones often occurs in hospital hall, laboratories, operating rooms (OR) and intensive care units (ICU) when dealing with severe illnesses [2]. Due to the urge of communicating, people now use mobile phones every where such as in their homes, offices, schools, churches, hotels and hospitals [3]. The mobile phones may get contaminated by bacteria such as *Escherichia coli*, *Pseudomonas aeruginosa* and *Klebsiella pneumoniae*, *Staphylococcus aureus* which cause hospital infection [4].

Enterococci faecalis are the normal flora of the intestine in human body. *Enterococcus* genus includes more than 20 species. They are normal inhabitant of intestine and very few are pathogens. These organisms are facultative anaerobic microbes. These organisms that can survive in high temperatures of 60°C for short periods and also can

grow in high salt concentrations. *Enterococcus faecalis* and *Enterococcus faecium* are the most prevalent species cultured from humans, accounting for more than 90% of clinical isolates [5].

2. MATERIALS AND METHODS

2.1. Sampling Procedure

A total 472 swab samples of mobile phones from hospital personnel were collected and studied for the carriage of a pathogen during dated December 2010 to June 2014. These samples were usually collected from the mobile phones of staff members of various hospitals these samples were carried out in the Department of Microbiology, Shri Bankey Bihari Dental (SBBD) Collage Hospital & Research Centre, Ghaziabad (UP) for further process.

Samples were collected from two populations- Health care workers (HCWs) and non Health Care Workers (non- HCWs).

Health care workers (HCWs):-	Doctor's	100
	Nurses	149
	Lab staff	74
	Ward boys	75
Non Health Care Workers (non- HCWs):-	Patient's attendant	74

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 $37^{o}C$. 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.

2.2.1. Identification of isolates

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

2.2.2. 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% (466/472). Similarly, a study reported a positivity of 96.1% growth of bacteria on mobile phones, of these 14.3% of bacteria are known to cause nosocomial infections [6]. The bacterial contamination rate of 94.5% among the hospital staff mobile phone was reported [7]. In a similar study, in Mahatma Gandhi Mission (MGM) hospital's Mumbai found the deadly superbug MRSA on some of the 120 mobile phones belonging to healthcare professionals that they tested, the MGM team took swabs from the mobile phones of 120 healthcare personnel, including doctors, lab technicians, nurses and ward boys. The mobiles of 50% of the 30 lab technicians surveyed had pathogens which are disease causing microbes, while phones of 36.6% doctors had pathogens [8]. The characterization of the *Enterococcus* sp. was done using colony morphology, microscopy and different biochemical tests, they are Gram-positive, non-spore forming, facultative anaerobic bacteria, on blood agar tiny deep pink colonies, Non hemolytic, catalase and Oxidase negative, fermentation of sugars, manintol, sucrose and sorbitol positive showing in Table 1. Our study showed, the growth of *Enterococcus* sp. from total mobile phone samples of health care workers (HCWs), and non health care workers (non-HCWs) was 13.9% (65/466) showing in Table 2. Quantification of the growth of isolated *Enterococcus* sp. from the total doctor's mobile phone samples was 14.2% (14/98) showing in Table 2, the growth of *Enterococcus* sp. from nurses mobile phones was 11.4% (17/149) in Table 2, and comparison of the bacterial growth from mobile phones of HCWs was 13.4% (53/393) and non-HCWs 16.4% (12/73) showing in Table 3. We found that growth of *Enterococcus* sp. is very light.

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

S. No.	Parameters	Characterization
1.	Cultural Characteristic on Blood agar	
	Aerobic / Anaerobic	facultative anaerobic
	Temprature	35-37°C
	Size	0.6-2.0 x 0.6-2.5µm
	Colour	Tiny deep pink colonies
	Haemolysis	Non hemolytic
2.	Microscopic examination	
	Gram's staining	Gram☐s Positive
	Motility	Non motile
	Spore	Non-spore forming
	Shape	Cocci in pairs or in short chain
3.	Biochemical characterization	
	Catalase	Negative
	Esculin	Positive
	Oxidase	Negative
	PYR test	Positive
	Gas production	Negative
	Ammonia from arginine deamination	Positive
4.	Fermentation of sugars	
	Manintol	Positive
	Sucrose	Positive
	Sorbitol	Positive

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

S. No.	Analysis Parameter	For Total Mobile Phones	For Doctor's Mobile Phones	For Nurse's Mobile Phones
1.	Total no. of Mobile Phones	472	100	149
2.	Mobile Phones showing no bacterial growth	06	02	00
3.	Mobile Phones showing bacterial growth	466	98	149
4.	Number and Percentage of Mobile Phones having *Enterococcus* sp.	65 13.9%	14 14.2%	17 11.4%

Table 3: Comparison of the bacterial growth from mobile phones of HCWs and non-HCWs.

S. No.	Analysis Parameter	Mobile Phones of HCWs	Mobile Phones of HCWs
1.	Total no. of Mobile Phones	398	74
2.	Mobile Phones showing no bacterial growth	05	01
3.	Mobile Phones showing bacterial growth	393	73
4.	Number and Percentage of Mobile Phones having *Enterococcus* sp.	53 13.4%	12 16.4%

Table 4: Antibiotic sensitivity testing of *Enterococcus* 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.	55.3	11	++	Moderately sensitive
Cephalexin	PR	30 mcg.	-	-	-	Resistant
Tetracycline	TE	30 mcg.	-	-	-	Resistant
Cefotaxime	CF	30 mcg.	-	-	-	Resistant
Ciprofloxacin	CP	5 mcg.	-	-	-	Resistant
Pefloxacin	PF	5 mcg.	-	-	-	Resistant
Ofloxacin	OF	5 mcg.	-	-	-	Resistant
Cloxacillin	CX	5 mcg.	100	24	++++	Highly sensitive
Roxithromycin	RF	15 mcg.	-	-	-	Resistant
Lincomycin	LM	2 mcg.	-	-	-	Resistant
Gentamicin	GM	10 mcg.	52.3	12	++	Moderately sensitive

In other study the *Staphylococcus* sp. was most frequently isolated (20.2%), followed by *Bacillus* (18.0%), and the least occurring organism was *Enterococcus* sp. (1.3%) while it was 13.9% in our study, among all the isolated organisms from mobile samples [9]. Therefore understanding the ecology, epidemiology and virulence of *Enterococcus* sp. as a species is paramount in limiting infections such as urinary tract infections (UTI), hepatobiliary sepsis, endocarditis, surgical wound infection, bacteraemia and neonatal sepsis which usually inhabit the alimentary tract of humans in addition to being isolated from environmental. The interactions, similarities and differences between *Enterococcus* sp. isolates from both food and clinical sources need to be reviewed to give a full appreciation of the role *Enterococci* play in disease [10].

Twelve different antibiotics were used against isolated *Enterococcus* sp. from HCWs and non-HCWs mobile phone samples. The antibiotics sensitivity of isolated *Enterococcus* sp. was determined on Muller-Hinton agar by the disk diffusion method [11]. The diameter of zone of clearance measured to the nearest whole millimeter and interpreted on the basis of CLSI [12]. The *Enterococcus* sp. was found resistant to all antibiotics except cloxacillin (100%), co-trimoxazole (55.3%) and gentamicin (52.3%) as shown in

Table 4. In other study *Enterococcus faecalis* indicated all isolates as being susceptible to vancomycin, teicoplanin and nitroflurantoin, with 1.85% (1 of 54), 20.4% (11 of 54) and 68.5% (37 of 54) of the test isolates being resistant to ampicillin, chloramphenicol and tetracycline respectively [13]. According to National Nosocomial Infections Surveillance, the 28% of enterococcal isolates from the ICUs of the more than 300 participating hospitals were vancomycin-resistant. Clonal spread is the dominant factor in the dissemination of multidrug-resistant enterococci in North America and Europe [14]. The genes isolated from resistant enterococci, encode virulence factors, the common factors are the formation of gelatinase and hemolysin [15].

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